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The Farmer's Digest

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The Farmer's Digest

Volume 6 February, 1943 Number 9

New Hormone Works Wonders

Condensed from The Farmer

IF you are a dairyman the chances are that within the next few years the word, *Diethystilbestrol* will have become a common one in your vocabulary. Anyway you are likely to hear a great deal about it because the substance which bears that long name may become immensely important to American dairymen. It is a hormone substance, and Dr. W. E. Petersen and associates of University Farm, St. Paul, have proved that when properly injected under bovine hides it works such magic tricks as these:

1. Brings on milk flow in sterile heifers and cows comparable to that which would follow normal freshening.

2. Starts lactation in 8-months old heifer calves.

3. Increases butterfat and lactose content of milk by 1 to 1½% when injected into a normal cow during her lactation period.

4. Of interest, but not of economic importance, it will even cause mammary development in a bull or a steer to the point that some milk will be produced.

The material is synthetic, manufactured in powder form, is mixed with oil, and is injected just under the hide at a point halfway down on one of the animal's shoulders. It was developed by an English doctor, and because of its similarity to hormones with which Dr. Petersen had been working, he guessed that it might have some stimulating effect on milk flow in cows.

Working with Dr. W. L. Boyd, L. M. Ludwick and A. F. Sellers, all of University Farm, Dr. Petersen first selected four groups of animals for experiment. In the first group were four 30 to 37-month-old heifers, normal except for sterility. In the second group there were four eight-month-old Holstein heifers, and one 17-month-old Holstein heifer. The latter, because of a thyroid deficiency, had the size of a normal

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eight-month-old heifer. In Group III there were two cows. One was a six-year-old Guernsey that had had more than one calf and had been dry for more than a year, and the other was a cow that had only one calf and had been in milk for more than a year and at time of treatment was producing about eight pounds a day. In the fourth group there were two freemartins.

Treatment of heifers in Group I, those that were from 30 to 37 months old, varied. A 37-month-old Jersey was given dosages on four consecutive days, then three times weekly until discontinued after 27 days. A 35-month-old heifer was treated daily for three days, then on alternate days until the thirteenth day when treatment was discontinued.

The reactions to treatment of the latter two heifers were probably the most interesting of the lot. Elongation of teats was the first noticeable effect of the treatment. That was noticed in one after four days and in the other after seven days. Milking of the 37-month-old heifer was started after 22 days, and of the 35-month-old heifer after 12 days. When the record for the latter had been totaled after four months of milking, she had produced 98.2 pounds of butterfat, and the former, after six months of milking, had produced 165.1 pounds. Whether that was as good production as the two might have made had they been normal and freshened normally there is no way of knowing, but based on the records of their dams and the records on their sires' side of their families, it was satisfactory production.

The heifer calves never attained high production. The best that any of them did was eight pounds of milk a day. After three weeks of milking the six-year-old cow in the third group was producing nine pounds of milk a day and the trend was rapidly upward. The second cow in this group was producing about eight pounds of normal milk a day when she was treated, and she had been in milk for more than a year. Instead of increasing, her milk flow decreased as a result of treatment, going down to one pound on the tenth day, and the milk resembled that of acute mastitis, although there was no infection. Only a little milk was obtained from one of the freemartins, and none from the other.

Both the bull and the steer that were treated produced minute quantities of milk, then after a few months they returned to normalcy. The experiment which brought an increase in the butterfat and lactose content of milk was made on a mature cow during her normal lactation period. While treatment continued the butterfat content and lactose con-

tent of the milk increased to 1½% over what it had been and remained at that level, but within 48 hours after treatment stopped, the butterfat and lactose content was back to normal.

Scientists like Dr. Petersen and his associates will do no speculating about what use dairymen may ultimately make of the results of their experiments. Theirs is the field of pure science. But their reluctance to speculate doesn't keep others from doing it. What may come of this work? Well, one thing obviously in the offing is the possibility of bringing back into production cows which have become sterile after having produced one or more calves, and bringing about milk flow of heifers that fail to breed. Cost of the material used for treating the experimental animals in these two classes ran about $1 per head.

Cow-testing association records reveal that if cows could be freshened artificially, hundreds of splendid animals could be saved from the butcher's block.

What use will be made of this hormone will depend largely, of course, upon continued study of it. At the moment, the scientists aren't sure that it is exactly the hormone they want for the purpose, nor are they sure they have found the best technique for administering it. It is altogether probable that after working with a few hundred animals instead of the few that have been worked with up to now, the failure of a cow to breed won't cause a dairyman to worry. He'll just go to town and get some diethystilbestrol.

Birdsfoot Trefoil

This new crop sowed with timothy on the farm of W. W. Fortune, Essex County, New York, formed a dense stand 27 inches in height. It was sowed in the summer of 1941 without a nurse crop at the rate of eight pounds of timothy and four pounds of trefoil to the acre. Special inoculation was added. Yields taken of a similar mixture on a neighboring farm showed a green weight of 12 tons to the acre. When crudely dried by home methods the yield approached 3.6 tons to the acre.

—*Successful Farming*

Bacteria Play a Two-Faced Role

Condensed from Farm and Ranch

D. M. Seath

Louisiana State University

BACTERIA play the role of Doctor Jekyll and Mr. Hyde with livestock men. Long considered as harmful and necessitating the use of strict control measures, now comes the information that bacteria are an important adjunct in digestion, and in this role make it possible for the four-stomached animals to enjoy a balanced ration on the simplest of feeds.

The fact that bacteria are responsible for many human and animal diseases and cause rapid decomposition of food, is not news. It is news, however, to learn that millions of bacteria live in the paunch or first stomach of cattle, sheep, or goats, and are actually responsible for supplying the "missing links" in an otherwise incomplete ration.

Bacteria have long been credited with helping break down some of the cellulose or fiber in the feed, thus enabling the digestive juices to convert a portion of this normal waste into nourishment for animals. It has been known that this is one reason why four-stomached animals could more economically use roughages than could single-stomached animals such as the pig. Recent findings show that the bacteria also build up incomplete proteins and actually manufacture certain vitamins.

Certain amino acids, which are commonly called the building stones of protein, are needed in a balanced diet or ration. Peculiar as it may seem, the human and the rat need about the same amino acids for good health and growth. In fact, most single-stomached animals, including the lowly pig, have comparable requirements. The comparison does not hold true, though, when we try to fit cattle, sheep and goats to this rule. These animals with the help of bacteria apparently manufacture many missing amino acids, with the result that a highly complex assortment of protein-rich feeds is not always necessary. This is especially true when good quality roughage is being fed.

This same fact holds true for certain of the vitamins. It has been shown that the amount of

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vitamin C in the ration does not directly change the amount of this vitamin in the milk of dairy cows, thus indicating that the four-stomached digestion apparatus must help manufacture this vitamin. It is definitely known that the fermentation occurring in the paunch results in the manufacture of many of the B vitamins. The process in the latter case is similar to the yeast fermentation which also results in large quantities of the B vitamins.

Experimental results are confirming the indicated efficiency of the four-stomached animals. The Ohio Agricultural Experiment Station recently found that a grain ration consisting of corn and soybean meal gave as good results when fed with legume hay, silage and minerals, as did a complicated mixture consisting of corn, soybean meal, oats, linseed meal, wheat bran, beet pulp, and molasses. Likewise, a test with milk cows on pasture showed no superiority for the complex ration. A similar trial for a Jersey herd at the North Louisiana Experiment Station showed that ground ear corn and shuck when combined with cottonseed meal gave excellent results when cows were on good pasture or winter roughage of fair quality.

Following the war it is probable that a further practical use will be made of recent discoveries with four-stomached animals. Indications are that a cheap synthetic form of nitrogen, such as urea, will replace some of the more expensive protein feeds in rations. Right now the factories that could turn out this cheap nitrogen are making explosives. If and when they do return to manufacturing nitrogen compounds such as urea for livestock feed, it is probable that from 25 to 40 per cent of the protein can be successfully replaced. As in other cases cited, the bacteria in the role of Dr. Jekyll can convert this nitrogen to the necessary protein amino acids.

It is now possible for the owners of cattle, sheep and goats to profitably use the knowledge that bacteria are helping them balance livestock rations. Simple concentrate mixtures should become the rule, not the exception. The liberal use of home-grown grains plus one high protein supplement will in most cases suffice. This will simplify the concentrate problem and will permit more emphasis to be placed on high-grade roughage — including improved permanent and supplemental pastures.

Water and Your Dairy Cattle

Condensed from The Jersey Bulletin

Dr. R. R. Dykstra
Kansas State College

MILK, water and the dairy cow are inextricably bound together. That assertion is not to be interpreted as a facetious statement.

Milk as derived from the cow is approximately 87.2 per cent water and as a cow cannot change the composition of her milk it is necessary, in order that she may secrete milk in a satisfactory volume, that there be an adequate intake of water.

Every high school student is familiar with the fact that water chemically consists of a combination of the two gaseous elements, hydrogen and oxygen, in the proportion of two atoms of the former to one atom of the latter in each molecule of the resulting fluid water, which is expressed as H2O. The addition of another atom of comparatively harmless oxygen forms H2O2 which is lethal to animal tissues, though in 3 per cent dilution, and familiarly known as "peroxide," this is a safe disinfectant.

Rain water is the principal original source of most of our waters. Contrary to general opinion it is not in the strict sense of the word pure. During its descent to the ground it absorbs various substances contained in the air such as dust, germs and gases—the latter resulting in a faint acid reaction, though pure water is neutral. When gathered from roofs rain water is usually badly polluted.

Surface water as found in shallow puddles, pools and ponds is not safe for animal consumption because it is always badly contaminated with decayed organic matter, especially from manure, as well as germs, worm eggs, and forms of minute animal life. This is especially likely to be the condition in the vicinity of animal habitations. Large ponds, though actually surface water, are not so dangerous from this standpoint in many respects because extraneous matter tends to settle to the bottom to undergo dissolution. On the other hand if the water in large ponds is frequently riled by animals walking in it and by depositing their urine and manure in it, then it may be a source of illness in the herd members consuming it.

Another form of surface water

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is running water or the water of streams. This is safe for animal consumption only when no other animals are using it for some distance up-stream. It is well known that the bacterial spores of anthrax and blackleg, as well as the germ of brucellosis (Bang's abortion disease), and the virus of hog cholera may be carried down stream for a considerable distance. To be safe from these plagues the prudent stock owner keeps his animals away from water sources of this nature. On the other hand if up-stream water traverses wooded areas or grassland with no large groups of animals near by, it is a reasonably safe water for down-stream animals.

Artesian water especially, and spring water to a less extent, are safe for animal consumption. The principal objection to artesian water is that in its subterranean passage through layers of stone, salt and other inorganic compounds it absorbs much of this material so that it becomes hard or "alkali." Spring-water is frequently no more than surface water and as such may have all the contamination of the latter.

Deep well water with proper safeguarding against the inflow of surface water is one of the safest for animal use. Originally it was surface water, but in order to reach its deep location, harmful material has been filtered out of it because of its passage through sand and gravel beds.

Even after it is safely offered in the most sanitary manner, an objectionable green scum occasionally makes its appearance on water. Frequent scrubbing of water troughs or tanks usually controls this, though in obstinate cases after the scrubbing the inside of the tank should have applied to it some full strength formaldehyde solution (formalin) which should be permitted to dry, and then the tank filled with water for animal use. Formaldehyde thus used is also a safe and efficient disinfectant of feed boxes. If the green scum still continues, the drinking water may have added to it some copper sulphate in the proportion of one part to each million parts of water. Practically this is effected by placing some copper sulphate crystals in a cloth bag and stirring this through the water so as to produce a faint bluish tinge. In this concentration it is not harmful.

Taken as a whole the source of water for animal use should be carefully scrutinized, and rejected when this is questionable. If water has noticeable odor or taste, or if it is decidedly cloudy, it is best not used.

Normally the body of the cow consists of about 60 per cent of water though it is not present to the same degree of concentration

in all of the tissues—it is much higher for example in blood than it is in bone. Water is the main constituent of blood, gastric juice, joint water and the contents.

Water is necessary to dissolve salt and other inorganic chemicals preliminary to their absorption by the tissues of the body; solid food is prepared for digestion by it, and the elimination of waste material is impossible without it. It regulates heat radiation by its skin evaporation. In this connection it is well to emphasize that during the cold winter months it is highly desirable to remove the chill from the drinking water of housed dairy cows. If this is not done much of the energy derived from food is changed to warmth production rather than to milk production. Under proper condition after the maintenance requirement of the animal has been met, from 60 to 70 per cent of digested food is recovered in energy values of the constituents of milk, though this is noticeably less when the water supply is of a low temperature.

Largely the intake of fluid is in the form of water by way of the mouth. It is also abundantly present in some foods—roots and tubers have 80 to 90 per cent, green fodders 65 to 80 per cent, cured hay 7 to 15 per cent, and grain 10 to 12 per cent. If there is more than 17 per cent to 18 per cent of moisture in grains it results in their fermentation, and the growth of molds. Dew on vegetation is another important source of water. Here also a word of caution in regard to the unaccustomed later winter or early springtime pasturing of grass or other green vegetation by animals in production that have been carefully nurtured during cold weather. Animals relish this fresh vegetation and they overindulge themselves. As it is chilled by dew or frost and the ground is still cold, the result is a terrific shock to the nervous mechanism of these "hot-house" animals, as it were, and all milk secretion may be stopped; later symptoms of indigestion may be observed. Some of these animals never return to a full milk flow until the next freshening. Always change to unaccustomed foods gradually—first fill up the animal on an accustomed food, and if other conditions are favorable permit a "topping off" with the new food.

Furthermore in all animals, and especially in the camel and sheep, water is manufactured in the body as a result of fat oxidation, and by the change of dextrose into glycogen. This forms the so-called metabolic water which is needed in the nourishment of the cells of the body. Metabolic water cannot be replaced by water from an outside source.

Water leaves the body in such secretions and excretions as milk, tears, perspiration, in expired air, and through the kidneys as urine. The amount of daily outward passage of fluid depends upon the volume of intake. A large secretion through any one channel results in a decreased output through others—if an animal perspires freely then there is a corresponding decrease in kidney elimination. However, during normal elimination there is no change in the concentration of the blood, though its salt content may be somewhat decreased. It is this latter factor that is largely responsible for heat exhaustion in man and animals, and it may be safeguarded against by an adequate intake and frequent replenishing of both salt and water where elimination is high.

Animals seldom exceed their normal requirement for water by consuming excessive amounts, and therefore "water intoxication" is virtually unknown in them. It can be produced experimentally, however, as when dogs are given large volumes of water by means of a stomach tube, there soon result retching, vomiting, and violent convulsions resembling those of strychnine poisoningso that death may take place.

On the other hand "dehydration" of the tissues due to excessive loss of fluid is observed as a sequel of many animal diseases such as in false milk fever (ketosis, acetonemia) of dairy cows, sleeping sickness of horses, distemper of dogs, and whenever an animal is affected with severe or continuous vomiting, diarrhoea, high fever, and large surface wounds or burns. The less vital tissues and organs are the first to give up their fluid, and therefore the skin becomes leathery and loses elasticity; in the very latest stages the blood, heart and brain suffer. In the blood there is increased viscosity so that it tends to stagnate in the capillaries. All of this leads to decreased urinary secretion with retention of harmful substances, and because of this the sweetish odor of ketones may be evidenced in the breath. Veterinarians handle the condition by the administration of normal saline solutions, and anomalous as it may seem, at the same time give glucose solutions to stimulate kidney action in order to eliminate accumulated harmful acid radicals. The saline solution if given soon enough repairs the defects of the dehydration.

The tainting of milk by the passage through the mammary gland of soluble substances in unaltered form is well known to dairymen. These are the volatile aromatics of plants, turnips, rape, and even the fishy taste imparted to the milk following the drinking of marsh water.

A question frequently raised is the time of watering an animal in relation to time of food consumption. There is no good evidence to indicate that the consumption of wholesome water as the need or inclination of the animal moves it should in any manner be curtailed. In fact the combination of an adequate water supply plus salt stimulates the secretion of gastric and pancreatic juices. Salt also tends to direct water to the skin, and aids to hold it in the body.

However, in oil country there are frequent complaints that the salt water derived from oil wells and discharged into streams where it is later consumed by animals is a cause of their deaths. Research has demonstrated that this is a question of total solids in the water rather than of salt alone. Cows in production have been maintained when the total solids in water, or of salt alone, do not exceed 15,000 parts per million of water, or one and one-half per cent. More than this results in unwellness.

Cattle Bloat

That their inheritance has something to do with whether or not cattle will bloat is indicated in results of a feeding trial recently completed at the Montana Experiment Station. Animal husbandrymen at the station believe certain beef-cattle families are more subject to bloat than others. Five groups of steers were fed identical fattening rations, consisting of ground barley, dried molasses beet pulp, and linseed cake, for 168 days. Each steer within each group was sired by the same purebred Hereford bull, but each *group* was from a different sire. The five groups, therefore, represented five different genetic backgrounds on the sire side. The dams were grade Hereford cows. Serious bloat during the feeding period was confined entirely to one group of steers, all from the same sire. In other groups there was either very little bloat or none at all.

—*Successful Farming*

Putting Fertilizer in Its Place

Condensed from New Jersey Agriculture

MANY experiments over a long period of years and widely distributed over the United States, have shown that the way fertilizer is placed in the ground is often more important than the quantity used. Properly placed fertilizer will often give as much increase in the yield of cultivated crops as twice the amount merely scattered over the seedbed and stirred in.

War scarcities of nitrogen fertilizers and the general desire to save freight space for hauling war equipment to seaports have focused increased attention on economies in plant feeding. Unfortunately, the special machinery needed for the newer ways of placing fertilizers is not available to all farmers. And, in fact, for the very latest fertilizer placement methods engineers have yet to design perfect machines. Nevertheless, by exercise of the ingenuity for which they are famous, farmers not adequately equipped with fertilizer-placing machinery can discard broadcasting in favor of furrow and row placement methods.

One method of applying fertilizer puts it in a band on each side of and slightly below corn, potato, and similar seed rows. To many corn and potato growers such placement is old, their planting machinery having long been equipped to do it this way. They are, therefore, well represented in the group that looks favorably upon the next logical steps in scientific fertilizer use—"hi-lo" and plow under methods.

In hi-lo placement, part of the fertilizer is put in bands near the seed and part is applied to a greater depth. It is for this kind of placement that little machinery has yet been commercially developed. Farmers are compelled, for the present, to devise their own methods of putting the fertilizer down deep in the soil and some are following the practice of dropping part of it on the bottom of the furrow at plowing time. (A fertilizer placer attachable to a plow is under experimental use at the New Jersey Experimental Station.)

Hi-lo and furrow-bottom placements have been amply demonstrated in the Station's experiments as a superior way of getting more of the fertilizer into the plant. This is especially true of the phosphoric acid part of the mixture. Unfortunately, this highly essential plant food has a

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marked tendency to combine quickly with certain soil constituents to form insoluble and, therefore, unavailable compounds. In a sense, when superphosphate is put into the soil, a race ensues between the soil and the plant roots to see which shall grab it first. If the phosphate is thoroughly mixed with the soil, as occurs when it is broadcast and then disced in, plant roots need so much time searching for it that, by the time they find it, more than two-thirds of it has already been captured by the soil.

Putting part of the fertilizer at furrow depth has another advantage, in that it causes the feeding roots to go more deeply into the soil than they would if the material were all scattered over the surface. The effect of their deep penetration is to provide a greater protection against drouth and at the same time to reduce the danger of cutting off the feeding roots during cultivation.

The most extensive users of broadcasting methods of applying fertilizers are the dairy farmers and the vegetable growers. Of these, the vegetable growers have the greatest opportunity to gain from a change in methods. The opportunity is real if the user is so fortunate as to have the disc drill needed for placing fertilizer. Here the discs are put down as far as they will go, which is from 2½ to 4 inches, depending on the soil. Other than for that used near the seed or transplanted plants, the entire season's supply of fertilizer is placed in this way in strips 7 inches apart, and below the reach of cultivator shovels. As a nurse feeding of the vegetable seedlings, a light surface broadcasting of fertilizer is made, or, in case of transplanted plants such as cabbage and tomatoes, a small amount of fertilizer is dissolved in the water that is put in the planter barrel.

Vegetable growers who are in a position to place their fertilizer in this way are quite likely to get as good results as if they used twice as much fertilizer on the surface and harrowed it in.

Many farmers maintain their usual production with much less fertilizer if they will give their land a heavy application of lime. Phenomenal savings can be expected where, through liming, the pH of the soil, designed to measure its acidity, is raised from 5.5 or less to 6.7 or slightly higher. This road to saving is closed, however, to potato and sweet potato growers who must keep their soils at about 5.2 to avoid such diseases as scab and pox.

Unlike fertilizer, lime should be thoroughly mixed with the soil. If the rate of application can be doubled, as frequently would be desirable, half of it should be applied on top of the land before

plowing and the other half scattered over the plowed soil and thoroughly disced into it in preparation for planting.

Farmers who want to do all they can to solve the Nation's food problem will certainly find some means of buying and applying more lime and will devise some scheme whereby the fertilizer is more largely placed in bands, with a considerable portion of it either down in the furrow bottom or at lower than usual depth alongside the row.

Demonstrates Reduced Feed Costs

Condensed from Pacific Rural Press

W. G. Marders

A POULTRY feeding trial carried on by Clyde Howden of Dinuba, California, with the Agricultural Extension Service co-operating, indicates that poultry feed costs may be reduced by the use of a high protein mash concentrate (30 per cent protein) and whole grain in separate hoppers constantly before the birds. Feeds used by Mr. Howden were commercial preparations.

The results of the trial were highly satisfactory, since the feed cost in the mash concentrate pen was $114.03 less than the feed cost in the all-mash pen. The feed cost per dozen eggs was 16.8 cents in the all-mash pen as compared to 12.5 cents per dozen eggs in the concentrate pen. Neither pen showed a phenomenal rate of production, although it was very steady.

There was no significant difference in egg production or mortality in the two pens, although the all-mash pen consumed more feed and had a somewhat greater number of pickouts.

The use of a mash concentrate and grain fed free choice by keeping hoppers of each before the birds constantly offers a considerable opportunity for poultrymen to reduce their feed and labor costs. Several precautions in the use of this type of feeding are necessary.

1. Start the birds prior to the time they come into production, giving them an ample period of time to become adjusted to this type of feed.

2. Do not neglect to watch the birds to determine changes in their condition.

3. Cull birds should be removed as they appear. Apparently culls will develop more

Reprinted by permission from Pacific Rural Press, San Francisco, Cal., Nov. 14, 1942

rapidly on this type of feed, since they are not forced to consume large quantities of high protein supplements.

4. A heavy consumption of grain may be expected when birds are fed free choice, a mash concentrate containing in excess of 30 per cent protein, when birds have access to whole grains. Approximately 75 to 80 per cent of all the feed consumed will consist of grain, while the balance will consist of the mash concentrate.

5. Keep the high protein mash concentrate and whole grain or grain mixture before the birds constantly. Allow them to select the feeds they desire by using one or more hoppers for the mash concentrate and a similar number of hoppers for grain. The birds are able to balance their own rations if given the opportunity.

Strawberry Clover

Strawberry Clover is a new forage that came to the western part of the United States from Australia. After Western experiment stations and farmers learned its qualities by growing and feeding trials in the late 1930's, Strawberry Clover moved east and promises to come into farm use in many parts of the country. Outstanding are its hardiness and productivity, once it is well established, and its palatability as a livestock forage. Given the opportunity, livestock will pass up other clovers and grasses in favor of this new pasture crop.

While it grows well on good land, Strawberry Clover also will utilize other soil types, being tolerant of low, wet ground and of both alkali and acid soils. The plant is somewhat like Ladino Clover, but has proved itself hardier. The foliage and flower are similar to those of white Dutch Clover. There are two types, short and tall. Either gives good service in pasture but the tall kind is easier to harvest for seed and it is a heavy producer. It is being grown at the North Dakota Experiment Station and at other Midwest and Eastern stations.

—*Successful Farming*

With Emphasis on Roughage

Condensed from Successful Farming

Rex Beresford
Iowa State College

MORE roughages and less corn will be found on the bill of fare for feeder cattle during the months ahead—and that's the way it should be.

Wartime demands for beef center mainly on the medium and good grades, and these kinds have been enjoying a relative advantage on the market. Cattle can use efficiently our record supplies of roughages, and this means that a greater proportion of our feed grains can be conserved for other kinds of livestock, rather than going into choice, long-fed beef.

Stockmen who previously devoted their efforts to full-corn-feeding cattle to high finish are interested in the experiences others have had with the more extensive use of roughage. Fortunately, we have a lot of feeders who are perennially long on roughage and short on corn. Many of these men have worked out successful feeding programs.

If there are not enough of the plainer grades to go around, or if priced too close to better grades, the feeder may want to get better cattle, altho they require longer feeding and a higher percentage of grain to do the job right. Even here, the cattle feeder will want to stick to his program of using the greatest possible amount of roughage and the minimum of grain needed to get the job done.

Colony and Colony, of Johnson County, Iowa, have the job of finding a market for bluegrass, legume hay, small grains, and rough feeds produced on a 525-acre farm.

Good to choice steer calves are bought in the fall. They are wintered well the first year on clover or alfalfa hay, corn silage, protein supplement, and enough grain to make them gain well, but with no attempt to fatten them. By May they usually weigh around 650 pounds. They are grazed the next summer without grain, except possibly a little protein cake in midsummer, when the grass is dry. They come off grass in the fall weighing around 900 pounds.

From here on the steers may be handled in one of two ways. In either case, their winter ration

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consists chiefly of corn silage and hay, with a little corn and protein concentrate. The grain may be increased gradually during the winter, until by March they are on full feed. Then they are continued on full feed in dry lot until sold.

In some seasons the full feeding is delayed until May, and the cattle are then summer-fed corn on grass. In any case, a 400-pound calf has been developed into a 1,250- to 1,300-pound steer with two-thirds or more of the gain made from grass and roughage.

Other feeders, who have available somewhat less grass but large quantities of roughage and forage to use thru the winter, handle their calves in the same manner the first winter, but summer-feed on grass a year sooner and sell them as fat yearlings in the fall. These calves are ready for market any time from September on.

Still other feeders prefer yearlings to calves. Louis Lorenzen, Jones County, Iowa, buys yearlings in October and winters them on a full feed of silage, some legume hay, and a protein supplement, with a little additional grain toward spring. When pasture season arrives the cattle are turned on bluegrass and brought up to a full feed of grain as soon as accustomed to grass.

Such a program, followed by a few weeks on full feed in the dry lot, makes good steers by September or choice ones by October or November. This program not only utilizes large amounts of silage and other roughage thru the winter, but allows this farmer to carry approximately half of his fertile farm in permanent and rotation pasture.

Another method of selling grass thru steers is followed by Will Breakenridge, Tama County. He is a comparatively large landholder in one of the most fertile sections of Iowa. He keeps 80-bushel corn land in grass, as he says, to save labor outlay and equipment cost. The big reason, of course, is that while saving work and expense he has been able to make the grass pay as well or better than corn.

His program is to turn grass into fat rather than growth. This requires cattle with most of their growth made—also real grass and plenty of it. He buys 850- to 900-pound two-year-old steers in the late winter, ahead of the heavy spring demand for cattle, to go on grass. Steers with much of their growth made and not too high in flesh are what he tries to get. He carries them on silage and protein cake from the time they arrive in February or March until around May 1.

The old fattening rule, "grass for two but only one on it," is followed. When the grass hard-

ens and its protein content decreases, a pound or two of protein cake per day may be fed and perhaps four to five pounds or more of corn and cob meal.

When the pasture season ends or the cattle have made full use of the grass, they are given a short turn in the feed lot to finish the job. Usually they come off pasture sometime between August 15 and October 1, depending on the initial weight of the cattle, the season, and market conditions. About 40 to 70 days in the feed lot is what it takes to make them good enough.

There are almost as many possible modifications of the suggested programs as there are cattle feeders. Plainer heifer calves can be used to especially good advantage with a combination of alfalfa and oats or other small grains and then be given a whirlwind finish on corn. Better heifer calves can be wintered on silage or hay and a light grain feed, finishing out in the dry lot or, under present conditions, getting grain on pasture. Young cows or "heiferettes" can be handled like steers of similar grade but for a shorter feed. One kind for the average feeder to steer clear of is the old, thin cow.

With heavy hay feeding or even with sorgo silage, more corn must be fed in the bunk than with good corn silage or fodder. The method and principle remain the same. Full-feed the roughage, feed plenty of protein with low-protein roughage, and limit the corn. To get the same results, it takes about 25 percent more corn in the bunk with sorgo than with corn silage.

With good alfalfa it takes a 50-percent increase in corn or even more, but the protein supplement can be cut in two or left out except for the last month or so. No more corn need be fed with alfalfa or good clover roughage than would be fed in the silage and grain ration. A combination that has worked well with full-fed alfalfa is one pound of corn per 100 pounds live-weight the first 60 days, and two pounds or full feeding another 30 to 60 days.

One more pointer about plain cattle—usually they work best for winter feeding and spring marketing. For the duration they are likely to be good almost any time.

Finally, after all the argument for roughage feeding, it might be a good idea for me to hedge a little. A lot depends on the roughage. It has to be good enough so the cattle will eat a lot of it. Feed is needed to put weight on cattle, and poor roughage alone will not do the trick. The poorer and less appetizing the roughage, the greater the need for grain feeding. So it's up to you, in this war year when grain feeds per animal are scarcer, to have satisfactory roughage for your cattle.

Wanted: Lime for Backbone!

Condensed from The Business of Farming

William A. Albrecht

Chairman, Department of Soils, University of Missouri

THE business of farming depends much on using the soil as the main factory. Our attention has been so completely absorbed above the soil that the real basis of "growing things" has not been commonly examined on each farm for its possible success and security.

With animals playing a larger part in the final accounting of profit and loss, however, we are beginning to recognize the possibility of doing something to feed our animals better by treating the soil with some added fertility. And animals tell us, unfortunately, that as meat producers they are not as certain of profit today as they used to be not many years ago.

Much of this uncertainty may be traced back to the declining fertility supply in the soil. When a 70% calf crop cuts into the margin of safety in the farming business, we are inclined to blame the bull. We have been told that he is "half the herd." When only one animal needs to be sacrificed to correct a 30% trouble, we are apt to dispose of the bull and pin our faith anew on another one that may not give us even a 70% calf crop.

Reproduction is a delicate physiological performance. The fecundity in it, by both female and male, is influenced more by the soil than by the pedigree. Soils with depleted fertility and producing forages that are consequently deficient in minerals mean that shy breeders and aborters will be more numerous. Losses through those channels alone, if corrected, may push the balance sheet in the farming books from the loss to the profit side.

During wintertime, feeds that are mainly of fuel value are not of great help in foetus production, which demands calcium and phosphorus in liberal amounts. When a cow calves and goes into milk production, the demand on her body for daily delivery of calcium and phosphorus goes even higher. Some soils are too deficient in these nutrients to enable the cow to go through the pregnancy period without developing acetonemia in late stages. Should she

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carry her foetus-building business through under strain, by sacrificing much of her own skeletal calcium and phosphorus for the offspring, she may yet break down in milk fever when the demand for the minerals arises.

"Pregnancy disease" among ewes is similar testimony when those with twin foetuses are more commonly taken with it. Rickets in calves, in spite of sunshine for vitamin D and of ample volume of milk, are occurring on soils from which the fertility has been highly exhausted. This exhaustion has reached a degree where the product of the milk is not necessarily of unvaried food value, which, even in milk, depends on the soil from which it is produced.

Animal deficiencies are pointing their fingers back to the soil and not to the drugstore. Plants given calcium and phosphorus via soil treatment do more than convey them to the manger. Plants manufacture essential food products, many probably still unknown as to composition and bodily service. They may be the means of making the animal sleek in the spring before the soil factory runs out of its raw materials. It may be the lack of these that gives us the poor animal appearance commonly ascribed to fly troubles by August.

Fortunately for better feeding values in the grains and forages for our livestock, and in the vegetable and animal products for human consumption, we are gradually putting the essential nutrient elements, calcium and phosphorus, back into the soil in a larger soil improvement program.

Calcium and phosphorus, or limestone and phosphate, as their compounds are called, need to become household words in the soil fertility list. There is no substitute for them, except as we will accept starvation. Lime needs to be used more often.

Lime or calcium is first of the items on the chemical list in the business of farming. It has gone ahead of nitrogen now that we know that legumes can serve us to run nitrogen-fixing plants on every farm.

Though plants and people may be mainly carbohydrates and fats, both of which originate in fresh air and sunshine, it nevertheless takes some soil minerals to put a backbone into them—so badly needed by all of us now.

As fast as we realize that what must be put into the soil determines what we get out of it, we can optimistically view the future. The soil is still our best support. It is still the basis of our biggest business.

Cooperative Woodland Management

Condensed from West Virginia Farm News

W. C. Percival
West Virginia University

ALTHOUGH privately owned woodland covers an area of West Virginia far greater than any other type of land, none of its owners have made it their chief business to give their forest property the best possible management. This is probably due to the fact that its owners are chiefly interested in something else. Farmers give their first attention to their crop and pasture land, coal companies to their sub-surface resources, lumber companies to sawing and selling lumber rather than maintaining their timber supply, and the thousands of absentee owners to their professions or businesses, not to their timberland. In other words, the growing of trees and the selling of timber is distinctly a side line with the great majority of landowners and, as such, it has been given very little serious thought.

Anyone recognizes that good management, not neglect, of a business or resource yields higher profits. How can good profitable management be brought to the woodlands of West Virginia when its owners are already fully occupied in managing their principal business of producing and selling wool, beef, potatoes, coal, gas, lumber, or providing services in the professions?

Six years ago this question was asked in just this way of the foresters on the staff of the West Virginia Agricultural Experiment Station. The answer has been worked out in a way which is entirely unique to the forest industry of the United States.

The central idea is an old one to members of co-operatives such as the Farm Bureau who have been working together to get things done for many years. It is simply this: Although it is impractical if not impossible to employ expert assistance in handling single small tracts, several owners can employ jointly an experienced timberman who can increase earnings by applying his knowledge of timber for the benefit of all. To place such an idea into operation, however, the owner must first be assured that such assistance is going to bring him increased earnings.

In order to test this idea and give landowners assurance from positive results, the forestry divi-

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sion of the Agricultural Experiment Station, working closely with the Agricultural Extension Service, interested the owners of some 20,000 acres of woodland, and they incorporated the West Virginia Forest Products Association as a farmer's co-operative. The principal purpose was that of employing a seasoned woodsman to help all members handle their timberland so that it would yield the greatest profits both now and in the future. This is the essence of private forestry. It is really the use of good common-sense business methods applied to woodland just as much as it is that of using technical forestry skills.

The first man employed by the Association was a woodsman with over twenty years of experience as a logging superintendent for a successful lumber company. The foresters from the Experiment Station and the Extension Service have worked closely with him now for over five years. The land-owners who pioneered in the development of the Association deserve a large share of the credit for its success. This type of a co-operative was new. A great deal of experimentation was necessary. Many changes from its original form were required to make it thoroughly practical and useful to new, as well as old members, scattered widely over northern West Virginia. It has grown until today it is aiding landowners in eleven counties of northern West Virginia and is able to accept members situated anywhere in the state north of the Kanawha River and west of the Allegheny Front. Its remarkable success can be attributed largely to the fact that it recognizes each member's woodland, whether it be a little 15-acre woodlot or a 6,000-acre tract, as a separate business problem; each of these business problems must be solved according to the kind of land which each owner has and also according to his individual financial situation. The financial factor is often of first importance. It often decides whether a stand of trees is to be developed for the production of highly profitable big timber or to be sacrificed in semi-mature condition to satisfy immediate needs. Whatever the owner's needs may be, they are given first consideration and, secondly, the land and young trees are given the best care which can be provided.

The method of operation which the Association members, the research foresters, and the extension foresters worked out together is as follows:

Woodland owners usually become acquainted with the Association through the Agricultural Extension Service. A county agent mentions it or an extension for-

ester sees a farm where the Association can be of service and tells its owner of this way to make the most of his wooded land. Often Soil Conservation Service men and Farm Security Administration employees have provided contacts between Association and landowner.

The owner of the woodland usually writes to the Association or to the Extension Forester at Morgantown; he states his situation and gives a brief description of his woodland including the number of acres, the kind and size of timber, and tells what he would like to do with it.

A forester in the Agricultural Extension Service then visits the tract at his first opportunity. If he can give the owner some helpful advice which does not necessitate any great amount of service, such advice is given freely. However, if there is timber to be sold and a careful cruise is necessary to obtain accurate data for marketing it on one or more specialized markets, this may require more time than he is able to give. In all events, he or any government - employed forester is not authorized to go into the business of marketing timber or to take responsibility for the profitable management of land. Where the landowner is not acquainted with the timber business or does not have the time to personally supervise the removal of his timber by being on the ground at least two days per week during the operation, he should empower some trustworthy capable timberman to act for him. This the Association does as its principal business, usually acting as legal agent for the owner.

The Association's manager inspects the timberland to determine what kind of service the Association can give. An accurate cruise is usually necessary. The owner furnishes the Association Manager with a means of locating the boundaries of the tract or he walks around the woodland with him and shows him the ownership lines. He also informs him of his plans for the future of his tract. A careful cruise is made to find exactly what there is for sale. This may require several days of work during which detailed tree measurements are taken. The merchantable heights are also carefully measured. From these figures the total saleable volume of wood is computed. A little information on the rate of growth is helpful, therefore a few borings in widely scattered trees are made with a hollow auger. The wooden cores which are obtained indicate the rapidity of growth. This provides the needed information regarding the amount of wood being produced per acre per year as well as the length of time which would be required to grow another crop.

The Association's manager then finds how much timber would bring if sold in different ways on several reliable markets. He prepares a tentative timber sale contract which is favorable to the landowner and is assured by the buyer representing the best market that he will accept the contract as written.

The landowner, the Association's manager, and often an extension forester then talk over the various possibilities. They know exactly what can be done, not by guess, but by measurement and by definite offers from firms whom the Association has found from experience will pay their debts. Plans are made which will best fill the landowner's needs. These plans are effectuated by a written agreement between the landowner and the Association by which the latter assumes the full responsibility of carrying them out. It is agreed that no contracts will be made which effect the owner's interests in his land without written approval by him. The agreement also makes the landowner a member of the Association with equal rights of control with other members regardless of the size of their holdings, equal rights to share in any patronage dividends in proportion to the dollar volume of business transacted. In this way, the landowner obtains experienced and skilled management for his timberland without relinquishing control. He still forms his own policies. The Association carries out his policies and he exercises complete authority over performance according to his policies by his approval power on every contract. Not a stick can be sold, not a tree can be cut without his approval.

When the Association has arranged contracts which meet the owner's written approval, then it acts as his experienced legal agent to represent him in the woods. He is assured that his wishes are observed in actual practice. Only those trees are cut which he specified because the manager of his Association or an assistant has marked each tree for felling. The Association manager requires the cutters to so notch the trees that they will fall away from the sound young timber and avoid damage. Details are cared for such as removing limbs properly to make smooth logs, cutting logs to the right length for a specified market, cutting out defects in order to maintain high log grades, placing of fender logs in skidding so as to avoid damage, maintaining roads and fences in good condition. These are all details, yet each one and a hundred more like them affect the landowner's return from his woodland either now or in the future.

The Association's forester is on the ground to see that the operation is done in the landowner's

interest. Often logs are sorted to be sent to different markets where higher returns will be realized. This is done on the landings. Logs are check-scaled with the buyer when sold on a per-thousand-board-foot basis. This assures the owner that he is receiving full returns.

Sometimes the Association contracts crews of loggers and haulers and sells the logs at the mill; other times it is more advantageous to sell marked trees on the stump. Since the Association is a strictly private cooperative corporation, it is at liberty to utilize the best business practice which it can devise for any particular tract. There is no red tape.

Expenses are held to a minimum and are charged against the returns from the operations as a Service Fee at a figure which is set in the original agreement. This is usually one dollar per thousand board feet for run-of-the-woods timber. Timber sorted for special markets such as veneer logs and handle stock requires special treatment which is justified by their high value. This special handling usually costs an extra one dollar per thousand board feet. The costs of handling other forest products such as pulp-wood, mine timbers, fence posts, railroad ties, etc., is about the same as that of saw timber and charges are made in proportion.

All costs of operations are paid by the Association out of returns received for the timber. These include costs for right-of-ways, road construction, cutting, logging, hauling and service fees. The Association has marketed over seven million board feet of timber up to July 1, 1942, and has been able to return to each landowner as much or a greater NET return than he could have obtained by himself. In addition the young trees have been carefully protected and the owner is assured he is keeping his woodland in the best possible condition for another crop.

If the owner desires, the Association's manager in cooperation with foresters from the Agricultural Extension Service make a growth analysis of the young reproduction and the immature growing stock. From this they can predict at what time the next crop of timber will mature and what kinds of timber it will contain. In fact the cutting operations usually desired by landowners are of such a nature that the composition of the next crop is determined. For instance, if many weed trees of poor form or subject to decay are left on the ground, they will furnish seed for still more weed trees in the future. But if these trees can be cut and sold even at a low price, the woods will have a higher percentage of valuable kinds of trees

which will make a future crop of high value.

A very important factor in managing a tract of timber is that of keeping enough sound young trees to maintain a continuous leafy cover over the ground. If the leafy tree canopy is removed, the direct rays of the sun dry out the ground. This seriously injures a forest in three ways: The growth of the young trees is impeded; the less valuable dry land species are encouraged to the detriment of the valuable moisture-loving trees; and, the dead tree tops which litter the ground after logging operations become so dry and inflammable that fire usually completes the destruction.

There are many important factors which, when properly appreciated and observed in practice, make for good, profitable timberland management. The Association has combined good business practice with technical forestry practice, resulting in an unbroken record of high profits to landowners and a healthy young stand of timber left after each operation. The West Virginia Forest Products Association has been developed as a non-profit, non-stock cooperative corporation. It cannot work any miracles unless you consider the application of common sense as a miracle. Old denuded hillsides cannot be made profitable over-night. But a good stand of mature timber can be made to yield a high profit and can be maintained in highly profitable production.

Ship Butter without Refrigeration

The Department of Agriculture has developed a process for dehydrating butter. Perhaps that is not the proper word, but this new development gives butter the same advantages as dehydration has given eggs, meat and vegetables. All water and oxygen are removed from the butter and we then have a product known as "butter oil," a delicately flavored product that can be kept indefinitely without refrigeration. It can be used as butter directly from the container or it can be reconstituted as the original product by mixing it with butter and salt plus about 1 per cent of dry skim milk. It can be shipped in 20 per cent less space than fresh creamery butter, and reconstituted after a year or more into a highly nutritious product.

—*Farm & Ranch*

Shoeing and Shoes for the Driving Horse

Condensed from The Eastern Breeder

Nick Saegmuller
Field Secretary, Virginia Horsemen's Association

SINCE the advent of the automobile and the passing of the driving horse as a means of conveyance, highway engineering has advanced by leaps and bounds. We all must admit that the concrete and the macadam highways are fine when traveled by auto, but when traveling in horse-drawn equipment they are far from satisfactory.

In looking back to the days when horses were in their glory, roads were largely of dirt or gravel construction and were more or less level. They afforded reasonably good footing and were not as hard as the proverbial rock. Today the concrete road is hard, there is no give to it, and it is somewhat slippery for a steel shod horse. Likewise, macadam roads are slippery and oftentimes crowned high in the center, thus making it hard on the feet and legs of the horse. As a result of the strain caused by the uneven footing, some leg trouble can be expected.

Naturally we are not able to lessen the degree of hardness of concrete or decrease the slipperiness of macadam, but we can help the horse and increase our own safety by the use of special equipment, namely, rubber pads or rubber shoes.

For quite some time horse shoe manufacturers have been selling and advocating the use of an iron shoe that works in conjunction with a rubber pad. This arrangement works satisfactorily in that it supplies some protection against concussion and it does to some extent prevent slipping. On the other hand, the expansion and contraction of the rubber at every step causes the nail to be loosened and thus makes it difficult to keep the shoes tight. Another disadvantage is that the entire floor of the foot is covered and as there is no way to fasten the pad securely across the heel, foreign matter can, and often does, work in between the sole of the foot and the pad and may cause trouble.

In more recent years there has come on the market a rubber shoe, the core of which, as well as the part coming in contact with the foot, is made of steel. This shoe is open between the heels as well as across the sole. No difficulty will be experienced in keeping this shoe tight. It will absorb

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the concussion and will prevent slipping. While the shoe is more expensive than a regular steel shoe, it will outwear several sets of the others on modern roads. When this is considered they compare very favorably. Care must be exercised to see that these shoes are reset at regular intervals. One word of caution regarding these shoes — do not hunt or jump a horse which is wearing them.

While on the subject of shoes that increase the horse's comfort and usefulness, as well as the driver's safety, an additional word or two on the general principles of shoeing might be in order. The purposes of shoeing are several: first, to protect the foot from excessive wear; second, to correct faulty positions of the feet and legs, thus increasing the horse's usefulness and speed; third, to prevent slipping, thus reducing the possibility of a fall.

When shoeing, an inspection of the horse at rest and in motion should be made in order that any irregularities in the foot's axis can be detected so that these may be corrected in the subsequent trimming and fitting. It is important that the proper relationship between length of toe and height of heel be obtained. The bearing surface must be level and in suitable condition for attachment of the shoe.

It is of prime importance that the shoe be fitted to the foot and not the foot to the shoe, as some farriers are inclined to do in these days. The sole of the foot should not be trimmed with a knife, and except in very rare cases, the bars must not be cut away, as they are intended to support weight and serve for the shoes to rest on. The cutting of the bars tends to cause contracted heels if the practice is continued. As to the frog, only ragged portions should be trimmed off and this should be done with a pair of nippers.

One thing that is often neglected and which should be given more attention is the resetting or changing of shoes at regular intervals. It will be noticed that in young horses and those that are so handled that their feet are kept moist, their feet will grow faster, necessitating a more frequent change than older horses. In the case of young horses, their shoes should be reset once a month, while older ones need it every six weeks. If this is not done corns are apt to develop. All loose shoes should be tightened at once. It is an excellent practice to make an inspection daily to make certain that all shoes are tight, thus preventing the loss of a shoe when far from home, which might cause serious trouble should the horse be forced to go barefoot.

Balance the Ration for Efficient Production

Condensed from Guernsey Breeders' Journal

George Werner and Gus Bohstedt
University of Wisconsin

FEED of high quality, grown upon the farm, is the backbone of economical and efficient milk production; and good legumes for use as hay, silage, and pasture are the answer to quality roughages and economical rations on most farms.

With roughages on hand as the base, the dairyman can choose a grain ration which will supply his herd with the feed needed for economical and efficient milk production. Table A will help in determining the amount of protein needed in the grain ration with

TABLE A

ROUGHAGE	Total protein needed in the grain ration
Good legume hay with well preserved legume silage, or Good legume hay with limited amount of corn silage, or Good quality alfalfa hay without silage, or Fine quality alfalfa hay fed liberally with only limited amounts of corn silage.	10 to 12 per cent
Good quality alfalfa or soy-bean hay with corn silage or Mixed hay with good legume silage fed liberally.	12 to 14 per cent
Good leafy clover hay with corn silage, or Medium quality alfalfa hay with corn silage, or Good clover-timothy hay without corn silage.	14 to 16 per cent
Good clover-timothy hay with corn silage, or Good clover-timothy hay with corn fodder, or Alfalfa hay that has been weathered and has lost considerable of its leaves, with corn silage.	16 to 18 per cent
Timothy or millet, or canary grass hay, with or without corn silage, or Timothy or millet or canary grass hay with corn fodder or shredded corn stover.	18 to 20 per cent

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different quality roughages.

When the feeds that are to make up the concentrate ration have been selected, write down the names of each feed, one below the other, with the home-grown feeds at the top of the list.

Set down opposite each feed the percentage of protein in the feed (See Table B). The protein percentages of different feeds will be found in Table C.

By a little figuring, find the amounts of the various feeds required to secure the proper protein percentage in the ration. For easy figuring use rations of 100 or 1,000 pounds. (See Table B.)

TABLE B

Feeds Available	Total Protein	Ration 1 Pounds feed	Ration 1 Pounds protein	Ration 2 Pounds feed	Ration 2 Pounds protein	Ration 3 Pounds feed	Ration 3 Pounds protein
	%		%		%		%
Corn-and-cob meal	8	500 ×	8 = 40	400 ×	8 = 32	200 ×	8 = 16
Barley	12	200 × 12 = 24		200 × 12 = 24		200 × 12 = 24	
Oats	12	200 × 12 = 24		150 × 12 = 18		200 × 12 = 24	
Gluten feed	24			150 × 24 = 36		200 × 24 = 48	
Linseed meal	34	100 × 34 = 34		100 × 34 = 34		200 × 34 = 68	
Pounds protein in 1000 lbs. feed		122		144		180	
Per cent protein in ration		12.2		14.4		18.0	

By varying the amounts of the different feeds, we have here worked out rations of three different protein percentages. Other feeds than those given may be used and the desired protein content of a ration secured by selecting the correct amount of the various ingredients.

A thumb rule which may serve as a guide is to "feed one pound of hay and three pounds of silage per day for each 100 pounds live weight of the cow." If fed according to this rule, a 1,200 pound cow would receive 12 pounds of hay and 36 pounds of silage per day.

If plenty of good quality hay, such as leafy alfalfa, is at hand, it may be fed in larger amounts. Some cows will eat two pounds or more of hay of good quality and two pounds of silage per day for each 100 pounds of weight. If good legume hay is fed liberally and corn silage fed in limited amounts, less protein will be needed in the grain ration.

TABLE C

Common Feeds for Dairy Cows

Feed	Total Protein %	Total dig. Nutrients %
Corn, ground	9	80
Corn and cob-meal	8	76
Hominy feed	11	85
Barley, ground	12	79
Oats, ground	12	72
Rye, ground	12	80
Wheat, ground	13	84
Beet pulp (dried)	9	72
Molasses, cane	3	57
Wheat bran	16	70
Wheat middlings, standard	17	78
Dried brewers' grains	25	65
Malt sprouts	25	71
Gluten feed	24	74
Distillers' dried grains (corn)	30	85
Linseed meal	34	78
Soy-bean oil meal	44	82
Gluten meal	41	82
Cottonseed meal	43	76
Soy-beans, ground	36	94

Feed Grain According to Production

Here are a few of the thumb rules for feeding grain to cows:

1. Feed one pound of grain per day for each three pounds of milk from Jersey and Guernsey cows; one pound of grain to four pounds of milk from Holstein cows; and one pound of grain to three and one-half pounds of milk from Ayrshire, Brown Swiss and Shorthorn cows.

2. Where cows are tested in D. H. I. A. and the monthly fat production of each cow is known, grain may be fed as follows, according to the fat produced:

With poor quality roughage:

Monthly fat produced, divided by 4, equals amount of grain to feed per day.

With medium quality roughage:

Monthly fat produced, divided by 5, equals amount of grain to feed per day.

With excellent roughage, feed liberally:

Monthly fat produced, divided by 6, equals amount of grain to feed per day.

Figured on this basis, a cow producing 40 pounds of fat per month would get ten pounds of grain per day if roughage were of poor quality, eight pounds if the roughage were of medium quality, and about seven pounds if the roughage were of excellent quality and fed liberally.

Other Feeding Suggestions

Feed milking heifers a little more grain than mature cows producing the same amount of milk. This takes care of the requirements for growth.

Grinding

Barley, wheat and rye, when ground too fine, become pasty in the mouth of the cow. These feeds are more palatable and more readily eaten when ground medium coarse.

Where grains are heavy and lack bulk, it will be well to feed them on top of the silage.

When corn-and-cob-meal makes up a considerable part of the ration, feed a little extra grain. Corn-and-cob-meal is bulky and may be better than ground shelled corn where the other feeds in the ration lack bulk.

Salting

Salt cows according to their needs, and do not force them to eat more salt than they may require. A good method is to mix one per cent of salt in the grain ration, and in addition give the cows access in the barnyard to block salt or loose salt. If the hay has been salted, allow cows free access to salt in the barnyard, but do not mix any in the ration. Salt cups are a satisfactory method of salting.

Commercial Feeds

Good commercially mixed feeds may be mixed with home-grown grains to make satisfactory rations. Buy these feeds on analysis and price and the reputation of the company that mixes them. While the feeds mixed by reliable companies are of excellent quality, some ready mixed feeds contain a great deal of filler, sweepings, and weed seeds.

Minerals

While most rations will contain enough of the necessary minerals, aside from common salt and iodine, there may be occasional need for extra phosphorus. Where rations that are largely home-grown are fed to high producing cows, it would be well to give cows free access to a good quality of feeding steamed bone meal, into which 10 per cent of salt has been mixed.

In acid soil areas, give cows access to a mineral mixture containing equal parts of bone meal and calcium flour.

If there is any question of an iodine deficiency, feed iodized salt. If, on the farm, there have been any cases of goiter in calves or hairlessness in pigs, it is evidence of an iodine deficiency, and iodine should be supplied.

Feeding Cows on Pasture

Good pasture is one of the very best feeds for dairy cows. To get the most milk from it, cows producing even moderately heavy should receive some grain in addition to pasture. The amount will depend upon the quality and abundance of the pasture and the production of the cow.

Pasture crops vary in protein content at different stages of growth. This fact should be kept in mind, and the grain ration adjusted to provide the right amount of protein as the pastures change in composition.

Use the following table to determine the proper protein percentage needed in the grain ration to balance various pasture crops at different stages of growth.

Pastures that do not provide sufficient roughage to fill the cows should be supplemented with stable feeding of hay or silage, or both.

Amount of Grain to Feed on Pasture

A common recommendation for feeding grain to cows on pasture is to feed one pound of grain for every four to eight pounds of milk produced. In any case, cows should be fed enough grain to prevent them from running down in flesh.

The following schedule may serve as a guide in feeding cows on pasture:

With pastures that fall in groups 1 or 2 in Table D feed one pound of grain for each two and three-quarters pounds of milk the cow produces above 20 pounds per day.

TABLE D

When the PASTURE is:		Total Protein in the grain ration should be:
1	Lush early spring grass or very early rye.	9 to 10 per cent
2	Alfalfa before and in bloom, or Sweet clover before bud and in bloom or Red clover, or Alfalfa-grass (brome, timothy) before grasses head out or Sudan grass (18 to 30 inches), or Kentucky Bluegrass before heading out or Rye after the very early stage (over 5 inches).	10 to 12 per cent
3	Alfalfa after bloom, or Sweet clover at seed ripening stage or Alfalfa grass (grasses heading out) or Sudan grass (over 30 inches), or Clover-timothy, or Kentucky Bluegrass headed out, or Timothy before bloom.	14 to 16 per cent
4	Kentucky Bluegrass after bloom, or Mixed grasses at haying time, or Timothy in bloom and in seed.	18 to 20 per cent

With pastures in group 3, feed one pound of grain for each two and one-half pounds of milk over 25 pounds per day.

With pastures in group 4, feed one pound of grain for each three and one-quarter pounds of milk over 10 pounds per day.

In the above schedule it is assumed that the milk is average in percentage of fat. Jersey and Guernsey cows may be fed slightly more and Holsteins slightly less than the schedule calls for.

In Table D the arrangement within each group is approximately according to the protein content of the crop, with the one highest in protein at the top. This fact may be given consideration in deciding on the proper protein level in the ration.

Naturally, there is some variation in the amount of protein in various crops, depending upon the fertility of the soil; the grasses particularly may vary considerably.

How to use the following table to get the most feed value for your money:

1. Write in column 3 the local price per ton.

2. Subtract that from the number on same line in column 2. Put remainder in column 4.

3. The feeds which can be bought with the biggest difference below the figures in column 2 are the cheapest.

In the example the local price of ground corn was $32.00 a ton. subtracting $32.00 from $40.00 leaves $8.00.

With ground barley, the local price of $34.00 subtracted from $38.00 leaves $4.00.

In the case of ground oats, $32.00 from $34.00 is $2.00.

Corn, then, is the cheapest feed of the three.

While this does not mean that you should use only one feed in a similar case, it does show which feeds are the cheapest. These figures are only approximately correct.

FEED BUYER'S GUIDE

	1 Relative Feeding Value on Base of 100	2 Relative Value With Corn at $40 a Ton	3 Write in This Column Your Local Market Price per Ton*	4 COMPARATIVE SAVING Subtract figures in Column 3 from 2
EXAMPLE	Per Cent	Dollars	Dollars	Dollars
Corn, ground	100	40.00	32.00	8.00
Barley, ground	95	38.00	34.00	4.00
Oats, ground	85	34.00	32.00	2.00
FOR YOUR OWN USE				
Corn, ground	100	40.00		
Corn-and-cob-meal	90	36.00		
Barley, ground	95	38.00		
Oats, ground	85	34.00		
Rye, ground	95	38.00		
Hominy feed	100	40.00		
Beet pulp, dried	90	36.00		
Molasses, cane	80	32.00		
Wheat bran	85	34.00		
Wheat middlings, standard	90	36.00		
Dried brewers' grains	95	38.00		
Malt sprouts	85	34.00		
Gluten feed	115	46.00		
Dried distiller's grains	120	48.00		
Linseed meal	140	56.00		
Cottonseed meal	140	56.00		
Soy-bean oil meal	140	56.00		
Gluten meal	140	56.00		
Alfalfa hay	65	26.00		
Clover hay	60	24.00		
Soy-bean hay	60	24.00		
Mixed hay (clover-timothy)	55	22.00		
Timothy hay	50	20.00		
Corn fodder (with ears)	50	20.00		
Corn stover (without ears)	40	16.00		

*Cost of grinding farm grains should be added to the market price.

The Sow Herd in Winter

Condensed from American Agriculturist

John P. Willman
Cornell University

THE active demand for feeder pigs and the favorable prices that have been paid for market hogs during the past year have caused many eastern farmers to breed a number of sows and gilts this fall. Many of these sows are owned by farmers who have had little or no experience with a breeding herd. Those who have not previously owned a breeding herd should have reasonably good success if they feed and handle their sows and gilts properly during the gestation and suckling periods.

The results obtained from the sow herd may be very gratifying or at times may be as discouraging as any enterprise on the farm. The ownership of a large litter of healthy, vigorous suckling pigs is the objective of all who own a bred sow. No one gets much satisfaction out of owning litters that are weak at birth and that fail to grow as good pigs should. There is entirely too high a mortality rate in the baby pig crop. Some of these losses can be reduced by the proper care of the pregnant sows and gilts.

The sow owner who is interested in March farrowed pigs usually tries to get his sows bred during the month of November. The gestation period is about 112 to 114 days in length. The heat period usually lasts for about three days. Most experienced hog breeders prefer to have their sows bred during the second or third day of the heat period because experience seems to indicate that larger litters are produced when the sows are bred late in the heat period.

Bred sows that are closely confined in a hog house during the winter usually do not give as good results at farrowing time as the sows that have been forced to take regular exercise during the winter. The exercise helps to prevent the sows from becoming too fat and enables them to farrow more easily. They seem to recover more quickly after farrowing if they have been given regular exercise during the gestation period. The over-fat sows may produce weak pigs and in many cases are so clumsy after farrowing that they injure or kill too many of their pigs.

When several sows are run to-

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gether it will pay to sort them according to their condition, requirements and disposition. The thin sows and the young sows or gilts should be kept in one lot and the fatter and "bossy" sows in another lot. When this is done, each group may be fed the feed it needs and all of the sows are more apt to carry the proper amount of flesh at farrowing time. If the sows are too thin at farrowing time they are not able properly to feed their pigs during the suckling period.

Warm quarters are not needed during the winter for the sow herd. The warmest quarters should be reserved for the fall pigs. A dry, clean, well-bedded colony house or other pen with the door opening to the direction from which the prevailing winds do not come, is satisfactory for the breeding herd. The doorway may be partly covered with burlap.

It is a good plan to locate the hog trough about 75 or 100 yards from the sleeping quarters. A hay rack or feeder may be located midway between the sleeping quarters and the hog trough. During favorable weather the sows will spend much time be tween feedings eating alfalfa, clover or soybean hay. This arrangement forces the sows to take exercise.

Rules for feeding pregnant sows and gilts may be helpful, but should not be followed blindly. Ordinarily a thin sow will get along on about 1¼ pounds and a gilt 1¾ to 2 pounds of feed daily for each one hundred pounds of body weight. This amount usually should be increased during the last five or six weeks of the gestation period. If the sows have access to alfalfa in a hay rack or if they are putting on too much condition, then smaller amounts may be needed.

The best results will be obtained at farrowing time if the bred sows and gilts have been fed adequate rations. The sows can use to very good advantage large quantities of waste feeds such as garbage, bakery refuse, cooked cull beans and cooked potatoes. These feeds should be supplemented with farm grains and with protein-rich feeds such as milk products, tankage, fish-meal or meat scraps. The rations should include a liberal amount of legume hay. Ten to fifteen per cent of ground legume hay may be mixed with the ration if the sows do not have access to hay in a rack. The leaves that shatter from the hay that is thrown out of the mow may be used in the grain mixture if ground legume hay is not available.

Many rations may be suggested that are satisfactory for the bred sows or gilts. As a rule, and especially if no milk products are fed, these rations should con-

tain from 3 to 5 per cent of tankage, fishmeal or meat scraps. If these protein concentrates of animal origin are not available then one and one-half pounds of soybean oil meal may be substituted for each pound of the tankage, fishmeal or meat scraps.

It is recommended that the bred sows and gilts also be given free access to a suitable mineral mixture. This mixture may consist of 40 per cent ground limestone, 40 per cent steamed bonemeal and 20 per cent salt. Some preliminary studies at Cornell University indicate that it may be wise to include iodized salt in the mineral mixture used for the bred sows. The mineral mixture may be supplied in a hardwood box that is located in a sheltered place or may be mixed with the ration at the rate of one pound of mineral mixture in each 100 pounds of feed. Minerals may not be necessary if the rations contain protein concentrates of animal origin, but the above mineral mixture is not very expensive and a small percentage may prove to be good insurance if included in the rations for the brood sows during the feeding period.

Corn and Cob Meal Is Tested

Holstein cows made about the same butterfat production with corn and cob meal as the grain part of the ration as they made on ground shelled corn, in an Ohio experiment station test.

The 35 Holsteins in the test were fed and milked three times a day. The production was 1.5 pounds per day of butterfat. The cows on the corn and cob meal produced 45 pounds of milk daily, as compared with 46 pounds for the ground shelled corn group, but the butterfat test was enough higher on the former group to make up the difference in quantity of milk.

C. F. Monroe, of the Ohio station, concludes that it makes little difference as to the form in which corn is fed when sufficient quantities of protein and digestible nutrients are supplied.

Growth Regulations for Celery

Condensed from New England Homestead

T. R. Swanback
Agronomist

THE use of hormones and other growth promoting (or regulating) substances on tobacco at the Experimental farm in Windsor, Conn., has resulted in little or no advantage. Apparently, tobacco and perhaps other plants in this group, manufacture their own supply of these vital substances in sufficient quantities to make additional supply superfluous.

Celery, on the other hand, is a plant that requires a soil with high organic matter content (e.g. muck) which suggests a possible high requirement of growth regulators. It is said that celery land can hardly become over-fertilized. This suggests further that "growth regulators" necessarily must be abundant to keep balance with the profuse uptake of plant food.

A small field at the Windsor Station was planted with celery in the summer of 1942. The field, high in organic matter, was fertiilzed with a 10-10-10 mixture, at the rate of 1000 pounds per acre.

Four treatments with growth regulators in duplicates, were included in the test:

Control
Soybean Shells*
Transplantone (Regular)
Transplantone No. 8

*These shells are a by-product in making synthetic wool from soybeans.

The soybean shells were sprinkled in trenches where the celery

Yield Data on Celery Grown With and Without Growth Regulating Substances

Treatment	Plot	Pounds per Plot	Pounds per Acre	Average	Relative Gross Return per Acre
Control	A	31.7	36,994	38,044	$1,000.00
Control	B	33.5	39,095		
Soybean Shells	A	32.3	37,694	39,795	1,046.00
Soybean Shells	B	35.9	41,895		
Transplantone (Reg.)	A	34.6	40,378	40,812	1,068.00
Transplantone (Reg.)	B	34.9	40,728		
Transplantone No. 8	A	37.0	43,179	46,563	1,224.00
Transplantone No. 8	B	42.7	49,831		

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was to be planted; 2 quarts of shells for each plot. This rate corresponded to about 40 pounds per acre. Thus the amount applied can hardly be considered as having a fertilizer value but possible benefit from growth regulating substances might be expected.

Two teaspoons of Transplantone (Regular) and Transplantone No. 8 were added separately, each to 25 gallons of water. The roots of the celery plants were soaked in these solutions over night before planting.

The plots consisted of 3 rows, 40 feet long. They were arranged in such a way that 4 (1 series) were "outside" and 4 "inside" plots.

The growth of the celery was fairly uniform. Leaf blights were severe but fairly good control was obtained with sprays.

At time of harvest 8 plants from each row (= 24 plants per plot) taken at random, were collected for data, which will be found in the table below. Acre yields are based on 28,000 plants per acre, and a factor, 1167, was multiplied with the plot data to obtain yield per acre.

Some benefit seems to have been received from the soybean shells, probably enough to encourage further tests with this material, using varying quantities and possibly various methods of application. The "regular" brand of Transplantone produced still higher yield, although perhaps not significantly higher than the control plots.

Within the limits of the experiment, however, Transplantone No. 8 caused definitely higher yield than the control. Apparently the larger percentage of *naphtyl acetamide*, claimed to be present in Transplantone No. 8, is responsible for this effect.

If an arbitrary gross return value of $1000 per acre be given to the control, the soybean shells increased this value by $46.00 and the "regular" Transplantone by $68.00, while the use of "improved" Transplantone (No. 8) resulted in an increase of $224.00 per acre above the control.

One season's result is probably not sufficient to establish general recommendations but the cost and efforts involved are so relatively small that any grower might benefit from a trial with this "improved" growth regulating substance.

Pruning Peaches for Profitable Production

Condensed from The Southern Planter

A. M. Musser

Horticulturist, Clemson College, S. C.

EVERYONE who grows peaches would like to obtain as large crops as possible early in the life of the trees. Peach trees are not long lived when compared to many of our other fruits. The earlier in the life of the trees that large crops can be obtained, the greater will be the total production. The average peach tree during its third summer in the orchard produces a peck to half bushel of fruit. It is easily possible, by proper care, to produce from one to two bushels per tree.

The method of pruning the young trees is often largely responsible for the size of the crop. When either one-year-old or June-budded trees are set in the orchard the tops are usually cut back to 18 to 42 inches, depending upon the method of training. After growth begins in the spring, all but three to five of the new shoots are rubbed off. The three to five shoots are spaced two to six inches apart. These develop into the scaffold branches and form the framework of the tree. When the main branches are spaced six inches apart, they make stronger unions with the trunk than when allowed to originate near the same point as usually occurs in trees headed at 18 to 24 inches. At the end of the first summer's growth, the main scaffold branches should be well developed.

Pruning the first winter should be as light as possible. Only enough wood should be removed to keep the centers sufficiently open and to keep the trees well shaped and within bounds. This pruning will consist largely of cutting-back the scaffold branches, shortening some laterals and removing others. Such light pruning will leave a large number of vegetative buds or growing points for next year's growth. It will be remembered that tree leaves manufacture the food from which all kinds of tissues are formed. Each leaf manufactures a certain amount of plant food, the amount depending upon the length of time the full grown leaf is functioning.

For example, if a young tree starts the season with 1,500 growing points, a large number of leaves will be fully grown early in the season, and if kept healthy,

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will function until late in the summer or early fall, manufacturing food for the growth of the tree. On the other hand, if a peach tree is severely pruned the first winter, leaving only 300 vegetative buds or growing points, there will be a much smaller number of leaves fully grown early in the season, less plant food will be manufactured and less growth will take place. Such a tree will appear to be making much greater growth than a tree which starts out with 1,500 growing points for most of the growth will be concentrated in a few branches. But if the growth on both trees is measured in the fall, it will be found that the total growth of the tree beginning the season with a large number of growth points, is much greater than the total growth of the tree which started out with a small number of growing points. The latter tree will often continue vegetative growth too late in the fall for the tissues to become fully matured before early freezes occur.

Many growers say they prune their young peach trees severely in order that the trees may produce thicker trunks. This idea is entirely erroneous, for the trunks do not become as large as the trunks of trees lightly pruned. Certain parts of the tree are enlarged in size or increased in amount at different periods of the year. While vigorous vegetative growth is taking place in the tops of the trees, little root growth occurs and little increase in diameter of the branches takes place. But when top growth slows down or stops, and the leaves remain healthy, plant food continues to be manufactured and this plant food is then used to increase the size of the root system, to increase the thickness of the branches and trunk, and in the formation and development of buds. The growth in the tops of the tree is also thoroughly matured and is not injured when low temperatures occur unless the low temperatures are extreme.

Pruning the second winter is similar to the first in that no more wood is removed than is necessary. However, at this time it will be necessary to remove more laterals from the centers of the trees and many laterals of various sizes throughout the tops in order to keep them sufficiently open the next season. Some heading back of terminals and long laterals will also be necessary during the third season in the orchard. The trees lightly pruned the first two winters should produce from one to two or more bushels of fruit. Pruning the third winter should be somewhat more severe than the first two winters and after the trees reach full bearing age the pruning

should be severe enough to encourage plenty of new growth for full crops each year. Terminal growth of 15 to 24 inches is regarded as satisfactory. Pruning bearing trees also helps to thin next season's crop and such thinning can be done quicker and cheaper than it can be done by hand.

However, all thinning cannot be done with the pruning shears for excessive pruning would result and so reduce the crop of fruit that although those fruits which were produced would be quite large and well colored, the amount produced would be too small to be profitable. This pruning of bearing trees in order to reduce the cost of thinning requires considerable time in large trees because a large number of laterals of various sizes must be removed or shortened. Many growers think it is a waste of time and money to do such detailed pruning. Nevertheless, some peach varieties set fruit in excessive numbers which must be reduced one way or another if marketable size is to be obtained. So it is a case of whether the grower wishes to remove many of them by pruning or hand-picking.

This detailed pruning allows sunshine to penetrate to all parts of the trees and causes the fruit to develop excellent color. Since grades are largely determined by size and color, the proper kind and amount of pruning will influence the amount and grade of fruit produced. While peach trees are pruned to the open-center system, it does not mean that the centers of the bearing trees must resemble an inverted open umbrella or dish-pan in that a large area which could be used for bearing fruit is wasted and only a thin layer of bearing wood forms the outer portion of the trees. A more profitable method is to have a thick layer of bearing wood make up the trees with the centers open just enough for a sufficient amount of sunlight to reach all parts. Such trees will produce larger crops and hence greater total yields per acre than the system which wastes so much space in the center.

Winter-Time Management for Parasite Control in Sheep

Condensed from The Ohio Farmer

D. S. Bell

A WAR-TIME need from the sheep industry is already appearing and may be extremely acute, if not alarming, later. Absorbable surgical sutures used in nearly all abdominal and internal surgery are made from a certain portion of the sheep's small intestine. Heretofore, these have been largely imported into this country because our own sheep suffer damage to the intestinal wall from a small parasitic worm peculiar to sheep and goats and known as the nodular worm.

At the Ohio Experiment Station we have been engaged for some six or seven years in a study of ways and means of preventing or destroying this and other parasitic infestations to which sheep are subject. Our experimental results show that these mixed parasite infestations can be prevented and thus our need for sutures supplied. The task, however, is not easy. The program will require that certain details of flock and pasture management be closely and rigidly followed.

On the point of sheep and pasture management, almost all sheep growers are aware that manifestations of internal parasite infestations occur largely during the summer time; also, that lambs suffer more acutely than do older sheep. For these reasons sheep growers direct their effort toward treating lambs and wait until summer time to do it. This is too late—the infestation already exists—the damage has been done.

All prevention practices in connection with this, as well as many other diseases, are based on the point of destroying infestation at its source. After all, parasitic forms are living things which do not occur spontaneously, There must be a source of winter-time carry-over in order to have summer-time infestation.

Briefly — three such sources exist. The resident flock of old sheep is the most important. Many examinations reveal that such sheep may, and frequently do, carry fairly heavy worm burdens without showing any evidence of such infestation. All of us have been inclined to neglect this source of infestation by

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assuming that if these sheep appear in good condition they are all right. We should realize henceforth that if any lamb infestations occurred last summer, the ewe flock carries the infestation.

Our experiments have shown that to destroy this infestation, a winter-time treating program is highly effective. Administering tetrachlorethylene capsules to ewes every three weeks thruout the winter time destroyed from 90 to 98 percent of this infestation and produced no unfavorable results on the pregnant and nursing ewes or their offspring. It is axiomatic that if the source of infestation is reduced by 90 to 98 percent, less infestation should occur next grazing season.

Another source of carry-over of infestation is the pasture field on which the sheep have grazed. Our tests have shown that to render such a pasture free of infestation, sheep and goats must be kept off for 18 months, or two winters and one summer. It may be used in the meantime by other grazing beasts. With this knowledge of pasture field carry-over the sheep grower should strive to arrange his pasture program so as to use non-infested pastures. If he can't do this for all sheep, he should try to avoid them for the young lambs, which are the most susceptible to infestations.

The third source of carry-over of winter-time infestation is the stable residue or manure. Infestation from this source can be avoided by distributing the manure from the sheep stables on areas which are to be plowed and not those which will be grazed by sheep.

As to drugs—phenothiazine shows the highest all-purpose anthelmintic efficiency for sheep. It has the disadvantages, however, of rather high cost and of changing within the sheep's system so that the discharged urine becomes red. This urine will stain, or dye, the wool red if any wool comes in contact with it. This coloring will not scour out when wool is processed and, therefore, must be considered as damaged wool. For this reason, it is best not to give phenothiazine to sheep when they are in full fleece. It can be used and should be used when sheep are in short fleece, or after shearing and before they are turned to pasture.

As indicated earlier, tetrachlorethylene is another drug which is quite highly effective as a vermifuge. For winter-time treatment when sheep are full fleeced, it is probably the best. It may be a sound program sometimes to use the combination drench, of copper sulphur and nicotine sulphate, which is referred to as the combination or cu-nic treatment.

America's Meat Power Develops

Condensed from Farm Journal and Farmer's Wife

R. W. Howard

WAR will take *ten billion pounds* of livestock from American pastures during the next year. The convoys that make the run around Hell's Corner into Murmansk carry as many frozen steaks and hams as guns. Marines in the jungle thickets of Guadalcanal eat twice as much beef and pork as they did in civilian life. In the mess halls of the Flying Fortress bases across Britain, the bomb crews stow away Iowa pork, Illinois beef or Kentucky lamb three times a day.

Thanks to the research performed during the past five years by producers and packers through the National Livestock & Meat Board and similar agencies, war's dietitians know that meat supplies half the fighter's iron and protein, and more than a third of his calories and phosphorus. Adequate meat supplies are as essential to our victory as guns, tanks and planes.

The demand for American meat across the Seven Seas has created sharp changes in the packing industry during the past two years. Boneless cuts, dehydration and concentrates have replaced century-old practices. These "inventions-of-necessity" are already reaching back to affect the producer, and may eventually equalize distribution costs in the trip from feed yard to table.

The packer's problem has been to provide means by which all the meat that war needs can be shipped across the ocean in a half to an eighth of the space it would normally take, without impairing the flavor or nutritional value.

Three methods have been developed. All of them are old in principle, but brought up to date by scientific control.

The Chinese were drying eggs in the sun 2,000 years ago. The Pilgrims' Indian guides carried pouches of dried venison when they went on hunting trips. Today, under the pressure of war, the meat packers are drying cooked cubes of beef and pork in little more than an hour—drying it so well and thoroughly that it takes up just one-eighth as much space, yet when soaked in water will revert to its original color and flavor with only 15 per cent loss of vitamins.

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War will call for and get 60,000,000 pounds of dehydrated pork before summer. Eggs, subjected to a similar process, are being turned out as powdered whole eggs, dehydrated yolks or whites. The whites have given the greatest trouble. The dried particles are so fine that they seeped out of the early machines and out into the drying room. Finally, processors evolved a machine three stories high that filters the albumen like so much face-powder.

The second method is one that was becoming increasingly popular before the war—canned concentrates. The field rations carried by parachutists, advance tank units and aviators are nothing more than pocket-size tins of meat loaf or cheese plus enriched biscuits, a dehydrated drink, concentrated bouillon and sugar tablets. Rations for mechanized troops include concentrated meat and hash, with a "canned heat" unit.

Third and most portentous development of the packers has been the shift to boneless beef and veal cuts. More than a third of every carcass is bone and inedible fat. In the past this has boosted freight costs, taken up space in warehouses and markets, only to land in the doghouse pail. The Army and Navy didn't look at it that way, of course. All the generals and admirals knew was that experienced butchers were at a premium, with the result that meat wastes were extravagant, while some fighters got tenderloin and others got chuck.

The packers went to work on the problem last year, decided that they could do all the cutting at their own plants, shipping the meat in standardized, graded lots instead of whole carcasses. The system divides a boned carcass into 50% steaks or roasts, 25% stew chucks and 25% ground beef. Each piece has a maximum weight of 10 pounds. Ground beef is packed in 10-pound bars. The cuts are packed in 50-pound boxes and quick-frozen.

Consequently, one refrigerator car, instead of three, hauls 40,000 pounds of beef to seaboard this fall, and carcasses yield 70% of meat instead of the 60% army chefs got in 1918.

The effects of such a program on both producer and consumer are obvious. In the future, sinew, bone, excess fat will be left at the packing plant to be turned into fertilizer, tankage and glue. Housewives will have less to complain about, unless they are inveterate soup-makers.

All three methods, de-boning, concentration and dehydration, bring the industry another step along the line toward sale of the animal on an "eating-quality" basis. The Department of Agriculture has already announced

that it will regulate livestock marketing for the duration. Such regulation may eventually mean a system that will allocate livestock directly to the packers. And if allocation comes, a fixed producer price on a dresser carcass basis is certain to follow—for a time.

Add it all up, then. When the call went out to produce hogs and cattle, growers produced. When the call went out to feed the world, the packers evolved means to do it. "There is no question in my mind that these inventions-of-necessity will result in a streamlining of marketing methods and facilities after the war," the vice-president of one Chicago packing company told me. "Preferential freight rates, top-heavy distribution systems, buying methods that have been open to argument, and grading systems must all be examined."

Finally, behind it all, look to the packer for new post-war products from meat, and fats. Blood plasma, glandular extracts, yellow bone marrow to combat "blood starvation," surgical sutures, are all by-products of the packers' laboratories already serving in the field. Synthetic rubber is under test in one Chicago lab now. There are, in Chicago alone, more than 500 trained packer chemists working to evolve new industrial products from pork and beef and lamb.

Milking Machines

Milking machine rubber lasts longer if you take good care if it. On this subject we quote George Taylor, extension dairyman at Rutgers University:

"Use two separate sets of liners, alternating them each week. Rubber needs 'rest.'

"Keep milker rubber parts clean and free from all butterfat, which causes deterioration.

"Rubber cuts easily when wet; use care in assembly and disassembly of units.

"Do not use chlorine solutions of a strength exceeding 250 parts per million, for excessively strong chlorine solutions injure rubber.

"If lye is used in care of rubber parts, be sure it does not remain in contact with metal parts."

Cutting Horses and How They Get That Way

Condensed from The Cattleman

W. M. French

IF you had a corral full of bronc geldings how would you go about picking one for a cutting horse? And what would you do to make him into one after you had picked him out? We have asked these questions of quite a few old-time "cow folks" and the answers they have given us, combined with a little experience and some observation on our own part, form the basis of these paragraphs.

The picking of a good cutting horse prospect from this imaginary corral filled with broncs has been the more easily answered of the two questions. Almost without exception our informants have started talking about a horse with a smart, short head that isn't carried too high, short ears, width between the eyes . . . a horse that was short coupled and stoutly made. They wanted him to show a little action in stopping and turning as he milled about in the corral and they wanted him to be straight gaited. In other words, they have described a Quarter-type horse . . . and then gone on to tell us of so and so who had a mule that was one of the best in cutting cattle that they ever saw. Or of someone's old Percheron mare that never let one get away, or of a long-headed, long-eared, rambling old wreck that worked with the best of them and made them look like beginners, or of an old crowbait with a hip knocked down that could outmaneuver anything on legs. So in all fairness it must be admitted that there isn't any particular kind of a horse that has a monopoly on the profession. But good-looking horses, just like the pretty girls at the dance, are the ones that get the attention . . . and the owner or foreman of a cow outfit has never been backward in putting the best looking horses in his string. And at the round-ups these same good-looking horses were the ones that got the practice in cutting cattle. So it is probably safe to say that most of the cutting horses in the Southwest are a bit above the average in looks as well as action. On the other hand, ungainly horses have sometimes shown such an aptitude for the work that they have forced their way into the circle of the elect . . . and cow folks are not at all backward in appreciating such a horse, for

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after all it is the performance that counts.

As for what it takes to make a cutting horse there is plenty of room for conversation. There are some who will go so far as to say that cutting horses are born . . . not made, and anyone knowing horses will see some truth in this statement. On the other hand, there are undoubtedly plenty of horses that would have made cutting horses, but something happened in their breaking and training to spoil them. And yet there are some horses that have gone through a lot of abuse and mistreatment and foolish handling and still made good cutting horses. Of such animals the statement that they are "natural-born cutting horses" seems to describe their case better than anything else. Nevertheless, even with the best of training the percentage of really good ones turned out remains low. Some say that if you get one top-notcher out of ten you are doing well.

The cow business of today offers fewer opportunities for a cutting horse to be developed in actual work than did the *Golden Age* when fences were few and far between. Round-ups today are usually short affairs and the big boss or foreman will do most of the cutting . . . occasionally being good to one of the boys by letting him come in and try his pony on a few. But in the days of the open range, when cattle drifted badly, the line riders and other ranch hands had plenty of chances to exercise their young horses. Mix-ups were frequent and a herd of two or three thousand cattle under five or six different brands gave the boys something to work on. They might get these cattle all separated and thrown back on their home ranges and then have the job to do over again within three or four days. Cutting horses really had a chance to develop under actual working conditions then. But even at that there were not as many good ones as one would expect to find. You frequently hear it said that a cutting horse is never a "sure enough good one" until he is smooth mouthed, and under present conditions, if a horse receives his only training while working cattle, he will probably be well past the colt stage before he develops into anything much. There just isn't the work. But in spite of the often encountered statements that cutting horses are just "born that way" and that a smooth mouth is one of their characteristics, we are going to make a few remarks on training young horses to cut cattle.

You just can't tell by their looks, for in a cutting horse that subtle something known as temperament, aptitude, or possibly we should say personality is the

thing that is really the outstanding characteristic of all top cutting horses. A good horseman recognizes this quality in the horse at a very early stage in his breaking and training. This characteristic certainly must be inherent, as it can be recognized too soon to have been the result of training. It is stronger in some horses than in others. The development of this natural tendency of the horse is where the training comes in. In working with a young horse, the trainer will sometimes discover that the horse has an alertness to the presence of other animals — he sees a chicken cross the corral and his ears snap forward to attention. He is watching. The trainer rides across the pasture and the young horse notices every cow and calf. This use of his eyes, which he signals with his ears, is one of the surest signs of the young horse having possibilities. It means that he will not have to be whipped into watching and following other animals. In short, it means that he might be one of those "natural-born cutting horses." Undoubtedly that was the breed that every old-timer drew upon for his horse that would "cut without a bridle."

Most trainers nowadays are using hackamores either with a rawhide bosal or one of the mechanical varieties on their young horses, at least until they have gotten over any tendency that they might have toward bogging their heads. Just how long the hackamore should be continued in use is a matter of opinion. Some say that the horse is going to use a bit eventually so put it to him as soon as you can and train him with it. Others feel that so long as the hackamore is used they are certainly not hurting the horse's mouth and that any jerking around that they might do in teaching the horse to turn and stop and back is all done without any chance of spoiling him. The same cannot be said of a bit, no matter how mild. In this connection might be mentioned another characteristic which the good horseman recognizes as being a natural tendency on the part of some horses which too early use of the bit, or an improper bit, will destroy in a hurry. This is the tendency of the horse to be quiet in bearing and action. A slobbering, head tossing, prancing, sidestepping, tail-wringing, spoiled so and so is the direct opposite of your good cutting horse. A number of these faults had their beginning with the use of the bit. Your good cutting horse is capable of making a hundred-yard sprint after a steer, stopping easily, and then coming back into the herd as quietly as if he were just out for a walk. People sometimes forget that a horse which will work well after one animal

has to put on a repeat performance within a few seconds — so your cutting horse must remain cool, calm and collected. "He's like a heel-fly in a herd," is the usual description for one of these fractious, charging, cold-jawed, fools. There is some prejudice against "hot blooded" animals as cutting horses and undoubtedly some of this originates in the difficulty in keeping such animals quiet when they have been warmed up.

The best place to work a young horse is in a big corral, preferably built on rather sandy ground that is free from rocks, and it is better if there are no other animals in the immediate vicinity to distract the horse's attention. A horse will work better in a corral because he is restrained by the enclosure from wanting to bolt and run . . . his tendency toward fractiousness is overcome in a natural way without effort on the part of the rider. The teaching of the horse to obey the rein in turning is perhaps best accomplished by setting up a row of barrels or other noticeable objects, the horse being worked back and forth in zig-zag fashion through this line of obstructions. Alternate barrels can be skipped, or the first barrel can be circled, then the second and so on. The horse learns by doing and can see a reason for turning when he goes around a barrel rather than being turned on the open ground. This is the same exercise that one sees performed in the "polo bending" at the horse shows. There is no better method of teaching a horse to be handy with his feet. The young horse, of course, is worked first at a walk, then at a trot, and finally at a gallop as he learns how to handle himself better and to obey the rein. The reins are held in the left hand, palm up, going from between the thumb and index finger down to the bosal. However, in first getting the horse to respond to the rein it sometimes helps if the hand is held with the knuckles up and a rein passed through the fist in each direction. This dividing of the pull on the reins will permit you to exert a more distinct pull on the bosal on one side and some pressure on the neck on the opposite side. The same result can be obtained by "plow-boying" with a rein in each hand, the head being pulled around with one rein while the other rein is pulled against the neck. Another method to get the horse to respond to the rein is to cross them beneath the horse's neck (when metal hackamore bits, or regular bits are used) so that pressure on a single rein pulls the head around and works on the neck at the same time.

These reining lessons can hardly be said to be completed until the horse does everything that is

asked of him on a loose rein. In other words, he must be willing and ready to obey his rider at a touch of the rein on the neck and without any pressure being put on the bits or bosal. A horse in turning correctly does not throw his head up and point his nose in the opposite direction from the turn in an effort to get away from the bit. Whenever you see that happen you know that the horse is not watching the animal he is being *reined* after. As a matter of fact, a real cutting horse works with a minimum of reining and turns with his head held at normal level or even lower—he must do so to keep his eye on the animal. Why, then, all of this reining exercise if the horse is going to do it by himself? The answer is about the same as the reason for all of the road work and rope skipping that a fighter does — he is training and conditioning his feet and legs to handle themselves with untiring skill. When a horse knows how to do a thing it is no trouble to get him to do it.

Spurs or a quirt should not be used in working the green horse, although many successful trainers do use the latter when the horse has developed more. But spurs when used too soon have a tendency to make the young horse juggy and unwilling. A quirt in the rider's hand is an almost irresistible attraction for a pony's eye, particularly when his tail has been warmed up with it a time or two. Later on, a quirt is a handy thing to slap the leggings with, or to shake at a steer to keep him moving.

When a horse is doing well the best thing in the world to do is to pet and praise him. The first time he does something right the trainer should really tell him about it, slap him on the neck, and otherwise show his pleasure. A smart pony eats this kind of treatment up. . . and at the same time it might be said that punishing a horse for *not* doing something that he had never been taught is silly. Teach him first and praise and pet him when he does well and you will find that there are very few occasions that call for punishment.

Stopping and backing were mentioned in connection with turning because they are just as much a part of his education as the neck reining. A horse is taught to stop from a walk or a trot rather easily by simply leaning backward and putting some pressure on the reins. But getting him to stop from a gallop or run is quite another matter. The correct stop is for the horse to squat a little and slide on his hind feet, the fore feet scarcely touching the ground. On the other hand, if he persists in halting on his fore feet it is a very rough and jarring stop. A horse galloped up to a corral fence and then set down is

almost forced to slide to keep from hitting the fence. Some trainers advise shoeing the horse behind and using him until his fore feet are tender (or rasping them for the same effect) with the result that the horse will work more on his hind feet. These hind shoes should be without calks as sliding a flat shoe is much easier and less apt to cause trouble. Stopping exercises work best in loose and sandy soil. Too much work of this kind is certainly not advisable for young horses as the chances for injury are considerable.

A horse is taught to back by standing before him and taking a rein in either hand and shoving him backward until he gets the idea. He is then mounted and backed from the saddle. The reins crossed under the horse's neck seem to work especially well here. At any rate, backing is an excellent exercise for strengthening the loin muscles as well as the muscles and tendons of the hind legs that are used in stopping. And a horse that has been taught to back seems to be able to stop much easier and with more willingness, particularly if he is backed for a few steps after every stop.

It certainly should not hurt a prospective cutting horse to become familiar with a rope—the rope being whirled and thrown from him and dragged around over him until he is absolutely unafraid of it. Corral roping, if it is done at a slow rate of speed, should hurt him very little, but it does not seem that it would be a good idea to use him for roping on the prairie, as the running might put ideas in his head about charging headlong after every animal he is put on. Any other riding that you can give the horse, providing it is done slowly, is undoubtedly good for him, as nothing takes the place of use in making a horse gentle. Later on, if he turns into a real cutting horse and belongs to an outfit with plenty of other horses, he might be saved for use at the round-up only.

So far everything that has been written here might be applicable to the training of any young horse for use under the saddle—the reader is probably beginning to wonder when the cutting is going to start. The act of cutting is simply the driving of an animal in the direction which the rider of the cutting horse desires. He may be driving the animal away from its mates, held in a round-up, in which case the animal being driven out is apt to show a little of his herd instinct by dodging and turning in an effort to stay with the other cattle. On the other hand, you might be bringing an old bull up to the home corral and find that he doesn't want to go into it, or

you might find a nester's old mule in your pasture that likes the grass and hates to leave. Any such situation calls for a horse that can stop and turn, not only at the command of his rider, but instinctively as well. To do this he must watch the animal he is after.

One of the easiest ways to get a young horse to work after something is to turn an old gentle work horse in the corral with him. The trainer mounts the young horse and proceeds to drive the old horse around the corral—he might need a pocketful of pebbles to flip at him to make him move, but the young horse thinks that he is doing it all and is very much pleased with himself. Anyone knowing horses knows that it is usually the young horse being chased about the corral by the old horses, so this sudden ascent to power is very sweet indeed to the colt. He will watch the old horse's every move and when he turns he will follow him without being reined. As he progresses in his handling the old horse can be worked along the fence row, turned back and forth, and otherwise driven about with as little use of the rein as possible.

When the young horse is ready to be taken out of the corral one of the easiest things to work him after is other horses . . . he enjoys bringing them up to the corral and will watch them and even try to keep them from turning back. However, there is always a temptation to let him out too much in running horses, so the trainer should never let him get above an easy lope. In fact, at this period in his training he should never be opened up after anything, as the chances are he would overrun it rather than turn it. Work him slowly and easily. If you have a bunch of milk cows to bring up in the evening, or any other trailing jobs, use the young horse and get him used to following something at a slow gait.

If the horse is still coming along in his work he can gradually be speeded up on working animals around in the big corral. An easy way to get him to turning quickly is to put a wild yearling into the corral and let the horse hold him in a corner, or work him up and down the fence, stopping and turning with the calf. And right here comes one of the important "don'ts." Don't turn your horse away from the calf, or any other animal for that matter. A horse can't see with his tail, so make him turn in the direction of the animal or where he was. Do this no matter if the animal has half-circled you and it would be closer to turn in behind it.

This quick turning is one of the cutting horse's chief accom-

plishments and it can be further developed by working the horse back and forth across the corral at a gallop, making him turn away from the fence when he comes up against it, and following a figure 8 route so that the horse will become adept at turning to both right and left. The sharper you can get the top and bottom of the 8 the better the horse is turning—until he gives the impression of turning back through himself. The footwork necessary for one of these sharp turns, sometimes called a "sliding cutback," almost defies description. While the horse is stopping on his hind feet there is a sudden breaking under of the forequarters as they come around. A horse making a turn of this kind will tax the skill of an experienced rider in staying with him and a little surreptitious horn hugging is frequently in order. However, for this particular takeoff we have always favored looping our elbow over this well-known ornament as often as circumstances demanded. When the horse is making this turn it is not the kind that you see the highly reined horse make when he stops on his haunches, rearing in the air, and then wheeling to the right or left as the rider commands. That type of turn has no use in working cattle. The cutting horse works low to the ground at all times and even when he slides on his hind feet in a straight stop he should do it without throwing his head up too much.

Finally the time comes when you feel that the horse can readily give an account of himself in a herd of cattle. The old rule of slow and easy should still be in effect. Ride into the herd from the direction that the cut is to be made, pick the animal to be brought out, and start working him toward the edge of the herd. The well-reined horse will pick up the animal to be cut with a slight touch or two on the reins (later he will seem to recognize him almost automatically). The rider should keep his horse from crowding the animal too closely, holding him back about twenty or twenty-five feet so that he will have the advantage should the animal turn to the right or left. In this way the rider can always keep between the animal and the center of the herd—always in a position to work him nearer to the edge and far enough back so that there is little danger of over-running. At the very edge of the herd the animal usually makes his final bid to stay with his friends and it is here that a little fast work is sometimes necessary to check him and boost him on out toward the cut. However, you will frequently see the boy making the cut jam his spurs into his horse and jump him out after the animal just as

it breaks from the herd. This practice should be avoided with a young horse, as it will get him into wanting to charge the animal he is after. At any rate, it would seem to be a poor reward for making the cut . . . or a quieting gesture for a horse that is to be taken back into the herd. A well organized round-up should have a couple of "off-bearers" ready to receive animals as they come from the herd and to give them a push on out toward the cut. The less running and fast work that your cutting horse has to do the better and the longer he will work in the herd.

You will frequently hear of such and such a horse being a "fast cutting horse," but when it comes to a question of speed or control the latter is unquestionably the more important. It doesn't hurt a cutting horse to have plenty of speed, but it is worse than useless if there isn't any control to go with it. Some experienced horsemen will even argue that a cutting horse can be too fast. But a great deal of the wild riding that occasionally goes on in attempting to cut cattle is the result of poor cutting rather than the wildness of the cattle or the speed of the horses. A steer which is checked at every turn has only one place to go and that is toward the cut. If he isn't checked he makes a break and the "run-down" starts. However, there are some cattle that are so wild that the entire cut is made on the run . . . such cattle become a milling, churning mass in the round-up, do not hesitate to run over a horse, and are a real job to cut. Such a round-up is no place for a young horse just learning the business.

Permanent Pastures in the South

Condensed from Commercial Fertilizer

O. E. Sell

Georgia Experiment Station, Experiment, Ga.

THE production and carrying capacity of the average Georgia permanent pasture is low because of the prevailing low level of pasture soil fertility. A pasture improvement program which includes proper liming, fertilizing, and seeding increases clover and grass growth to such an extent that the carrying capacity of the pasture is doubled and steer gains per acre have been more than doubled. The increased animal production on improved pastures is due in part to the increased pasture growth and in part to the higher nutritive value of pasture plants on limed and fertilized soil. Not only is the mineral content of pasture plants increased by liming and fertilizing, but some of our most nutritious and most desirable pasture plants fail entirely to grow or establish themselves on the prevailing poor pasture soils. In addition, winter clovers grow more rapidly and furnish earlier grazing where soil fertility has been improved.

Pasture improvement involves two major but separate steps—improvement of soil fertility, and seeding or sodding of desirable pasture plants. These two steps in pasture improvement must be intelligently co-ordinated and one step carried out without the other may result in failure to obtain pasture improvement. It should be kept in mind that a major part of the permanent pasture should consist of an association of one or more grasses and one or more winter clovers and that part of the pasture should generally consist of lespedeza with one or more grasses. Grasses respond very little to limestone, phosphate, and potash except on soils extremely deficient in these nutrients. The grasses respond mostly to nitrogen and the amount of response increases with an increase in the amount of nitrogen available. The pasture legumes, on the other hand, can be established only with, and their production depends on, the presence of appreciable quantities of available lime, phosphate, and potash in the soil. These pasture legumes, particularly the winter clovers, have the ability to utilize nitrogen from the air and make con-

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siderable quantities of nitrogen available to the summer grass that follows them. Indirectly, then, grasses are furnished the nitrogen which they require for growth by properly liming and fertilizing the winter clovers. In some years these winter clovers increase summer grass production as much as an application of 400 pounds of nitrate of soda. The greater the production of winter pasture clovers, due to optimum fertilization or other cause, the greater the stimulation of summer grass production. Improper management of the clover may, however, result in opposite effects—where rank winter clover growth is not sufficiently grazed in late spring, it will retard the earliness of, or even kill out some of the summer grass.

Proper fertilization does not insure successful pasture establishment. If the clovers, for example, are not properly inoculated, they may fail completely and there may be little or no pasture improvement. Lack of rainfall, improper seeding methods, or time of seeding may also result in failure of pasture establishment in spite of proper fertilization.

Liming is the most essential practice for sustained improvement of pasture soils. However, lime alone does not properly balance soil fertility and clover failures are common unless phosphate applications are made in conjunction with lime. On the heavy soils of central Georgia, this combination of limestone and phosphate treatments enables the establishment and growing of excellent winter clover-summer grass pastures. On the lighter soils, most commonly found in the Coastal Plain section of south Georgia, potash may have to be added to the limestone and phosphate treatments. Where a fair to good sod is present and on slopes that are not too steep, no advantage has been found in working lime or fertilizers into the soil as compared to top-dressings of these materials.

The amount of limestone needed depends on numerous factors, including soil type (light or heavy), the degree of acidity of the soil, the amount of available lime in the soil, and the type of pasture plant to be grown. Heavier soils generally require from ½ to 1½ tons of limestone per acre, while the light soils require from about ¼ to ¾ of a ton per acre. The degree of acidity of the soil and the available lime content can be taken into consideration if soil tests are made. Pasture plants vary in their lime requirements as follows, those plants requiring the most lime being first and those requiring the least coming last: bud clover, lappacea clover, black medic, sweet clovers, white dutch and

Ladino clovers, bluegrass, Persian clover, subterranean clover, lespedeza, crimson clover, hop clover, Dallis grass, bermuda grass, carpet grass.

In order for a legume seeding to benefit from limestone, it should be applied from a month to a year previous to the seeding of the legume. It is far better, however, to apply the lime at the time of the seeding than to leave the limestone treatment out entirely. A second application of limestone can generally be made to advantage several years after the first, and this should then be sufficient for six to ten years, depending on the rate used and on soil type. Lime will be leached more rapidly from light than from heavy soils.

The amount of phosphate required for pasture depends largely on the previous fertilizer treatment of the soil and on the legume to be grown. Where a cultivated field, which has grown cotton or some similar heavily fertilized crop, is to be developed into a pasture, only light applications, up to 250 pounds of superphosphate per acre need be used. Generally, from 400 to 500 pounds per acre of 20 per cent superphosphate or its equivalent are required for the establishment of white dutch, Ladino, and Persian clovers on land that has not recently been fertilized. Half of this amount of phosphate is satisfactory for hop clover, lespedeza, and generally for crimson clover. It is necessary to repeat phosphate applications every two to three years if the pasture is to be kept in a productive condition. Smaller amounts of phosphate are generally sufficient for pasture maintenance than for establishment. For example, where 500 pounds of 20 per cent superphosphate are needed for the establishment of clovers, 200 pounds every second year or 300 pounds every third year should maintain the proper level of available soil phosphate. The phosphate applications should be deferred until shortly before the winter clovers are seeded, or where made on lespedeza pasture, shortly before lespedeza seeding. Basic slag has been used successfully for the establishment of winter clovers and lespedeza. About 500 pounds of basic slag per acre are suggested for lespedeza and hop clover, and 800 to 1,200 pounds per acre for white dutch, bur, and similar clovers. Part of the beneficial effects of basic slag on clovers is due to its lime content, although on distinctly acid soils, a light application of limestone will be needed in addition to the lime furnished by the basic slag.

It has not been found necessary to use potash on the heavy soils of central Georgia. On some of the sandy or lighter soil types

75 to 100 pounds of muriate of potash per acre may be needed for successful pasture establishment. This application may have to be repeated every two or three years.

The pasture grasses respond very markedly to applications of nitrogen. Winter clovers on a summer grass sod will furnish the cheapest nitrogen to the grass. Whether or not nitrate of soda or other commercial nitrogen should be used in addition to the "clover" nitrogen depends on the amount of clover growth present, on the value of livestock or livestock products obtained from the pasture, and on the amount of pasture land available. Nitrogen may be badly needed on summer grass in years following poor winter clover growth. Nitrogen applied to summer grass is more profitable with dairy than with beef cattle. Where little pasture land is available and a large number of livestock are being carried, nitrogen applied to summer grass considerably increases the carrying capacity and productiveness of the pasture. If nitrogen is used, the equivalent of 150 pounds of nitrate of soda should be applied about June 1 and again about August 1.

Where clovers are seeded for the first time on pastures, inoculation may be poor or fail entirely due to weather conditions. The clovers then will develop slowly and the stand will be poor. Light applications of nitrogen will help these clovers establish themselves and they can be later inoculated by broadcasting inoculated soil. Manure will aid more toward helping to inoculate clovers on non-clover land than commercial nitrogen applications. Manure can also be used as a source of nitrogen on summer grass, although cattle will avoid such areas if other non-manured grass is available. Wherever a rank growth of summer grass results from the use of nitrogen of one form or another, precautions must be taken that the excess grass growth be grazed down close or mowed, otherwise it may crowd out or prevent the successful establishment of the winter clovers in late fall.

Complete fertilizers may be needed with a seeding of winter clovers or clover-grass mixtures, especially on light soils that require potash, and on new lands where the nitrogen will benefit the development of clover seedlings. Where a complete fertilizer is used for the above purpose, it should contain from 2 to 4 per cent nitrogen, at least 12 per cent phosphoric acid, and from 4 to 6 per cent potash. A typical application of a complete fertilizer would be 600 pounds per acre of a 2-12-6.

These recommendations for

limestone and fertilizers may not be satisfactory under some soil conditions. More accurate liming and fertilizing can be done if soil samples are properly taken from the pasture land and sent in to your Experiment Station, for analysis and specific recommendations. A still better method of determining the fertility requirements of pasture land is to apply limestone, phosphate, and potash, separately and in various combinations, on strips across the pasture. Response or lack of response in establishment or growth of pasture plants to these treatments will indicate which material or materials are needed. County agents can help plan such pasture fertilizer tests.

Winter Heifers Outdoors

Wintering heifers outdoors with a shelter for use on windy days is one method Maine dairymen are using to save labor in caring for well grown animals at least 12 months of age.

R. A. Corbett, dairy specialist in the Maine Extension Service, says that the heifers don't mind the cold but strong wind sends them under cover. Feed racks for hay and silage should be placed outdoors and not far from the hay storage. Enough feeder space should be available so that all heifers can eat at one time.

The animals should have a good supply of water. They will eat a little more feed to gain a pound than they would indoors, but this is more than offset when the heifers are turned out to pasture the following spring.

Heifers of this age need plenty of good roughage, and should have all they will clean up. Poor hay should be supplemented with two to four pounds of fitting ration a day. Heifers usually make better gains on hay and silage than on hay alone. One pound of dry hay for each six to ten pounds of grass silage is the ratio suggested by Mr. Corbett.

If the heifers are not fed grain, they should have access to a mixture of 40 pounds of steamed bone meal, 40 pounds of ground limestone, and 20 pounds of salt.

—*New England Homestead*

Were We Wrong About Brome?

Condensed from Kansas Farmer

REMEMBER, you can't successfully grow brome grass very far south or west of the Kaw river." This bit of advice has been passed along for years, with the general belief that brome in this state is well adapted only to counties in the northeast area. But experience with brome during the last few years has convinced many Kansas farmers that such advice is all wrong.

Ignoring old rules and traditions, brome grass has jumped the Kaw river and defied the boundaries of Northeast Kansas. It has pushed south and west to the Arkansas Valley, and is spreading its foliage over wide areas of farm land where agricultural scientists had virtually dared it to trespass.

This is especially true in Harvey county, where brome grass is pioneering on a wide front, some 100 to 150 miles from nearest points of its so-called "home base" in Northeast Kansas. With a shortage of good pasture land, farmers in Harvey county have long been in need of a good grass crop that can carry heavy loads of livestock.

In the last two years, this need has been intensified by war conditions. Trying to produce increased supplies of livestock with very little help, these farmers turned to grass and other crops that can be grazed off. For this purpose, brome grass proved extremely helpful because of its long grazing season and its heavy carrying capacity.

Among the many Harvey county farmers growing brome grass is T. H. Savage, who uses 38 acres of brome as the only perennial grass on his 500 acres of farming land. Some of his brome grass is eight years old, and Mr. Savage says he hasn't yet seen anything to make him believe the crop isn't well suited to that area, if the farmer is careful to use adapted, home-grown seed.

In fact, he rates it as the most valuable all-around crop on his place and he finds more uses for it than does the average farmer farther east, where brome is more commonly grown. Fields of brome on the Savage farm produce pasture, hay and a cash seed crop, all from the same field in the same year.

As a pasture crop, one of the most important advantages of brome grass is the fact that it offers such a long grazing season. Mr. Savage normally turns his stock on the brome grass early in

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March. If no seed crop is desired, the crop can be pastured on thru the year, and Mr. Savage finds that it usually provides excellent grazing until after Christmas.

With most of his brome grass, however, Mr. Savage varies this program to obtain a valuable cash crop from the seed. Stock is taken from the pasture before time for the seed to form, and the crop is combined about the first of July. Seed yields on the Savage farm have varied from 150 to 450 pounds to the acre, and have averaged 200 to 250 pounds. Selling at prices varying from 10 to 20 cents a pound, the seed has brought welcome returns that average $20 to $25 an acre, year after year.

Immediately following the seed harvest, Mr. Savage sometimes gathers a crop of hay. He noticed that the stems of brome grass do not ripen like stems of wheat or other small grains. Instead, the brome grass ripens only 2 or 3 inches below the head.

Therefore, when a seed crop is combined, the remaining stubble is green and still carries considerable foliage. Cutting this grass stubble for hay, Mr. Savage found it will cure and maintain its bright green color, giving good-quality hay which he considers is equal in feeding value to the best native prairie hay.

This summer, one 8-acre field cut for hay after combining, produced 165 bales that average 77 pounds apiece. This represents a hay yield of more than three-fourths ton to the acre. Regardless of whether a hay crop is harvested, fields of brome offer valuable fall and winter grazing, after the seed is harvested.

Mr. Savage praises brome grass for its versatility. In years when grass or labor are scrace, the brome may be pastured steadily from early spring until midwinter. On the other hand, if grass is plentiful, and if the farmer sees need for some extra cash, he can remove his stock long enough to harvest a good seed crop. Then, if he sees a possible shortage in his winter roughage supply, he can harvest a crop of brome hay. If not, he may start pasturing right after the combine.

As a cash crop, Mr. Savage considers brome grass is fully equal to wheat. Yet it is a perennial and does not require the annual expense of tillage and planting, required for wheat. At the same time, it provides pasture thru a much longer period than wheat which will be harvested for grain.

Brome, on the Savage farm, is usually planted after small grain crops such as wheat, oats or rye. The ground is plowed immediately after harvest, and is fal-

lowed until time of planting the brome grass seed. As a general rule, Mr. Savage plants a mixture, at the rate of 15 pounds of brome seed and 5 pounds of alfalfa seed to the acre.

As the alfalfa becomes thinner, brome grass gradually occupies the space. The legume supplies nitrogen which helps prevent a sod-bound condition so common to older stands of brome, and it increases the value of hay from fields of brome grass. Sometimes the stand of alfalfa is too thick and causes danger of bloating. When this happens, it is best to use the field for hay, until brome grass has crowded out some of the alfalfa.

Mr. Savage has also used sweet clover in combination with brome grass. However, he prefers alfalfa, because it is shorter and does not interfere with combining of the brome grass seed crop. Alfalfa also has the advantage of being a perennial, so it is not necessary for it to reseed every 2 years, like sweetclover.

In learning to grow brome in South-Central Kansas, Mr. Savage found it is extremely important to use seed adapted to that area. At first he had difficulty in getting good stands. This difficulty disappeared when he started buying Kansas seed that was produced reasonably close to his territory.

As an aid in maintaining his older stands of brome, Mr. Savage practices cultivation. Altho he has just started using this method, he feels it will probably pay to cultivate the crop about every other year. He has had best results with diamond-shaped shovels on his tillage implements used for the cultivation.

Value of brome grass and alfalfa for hog pasture is demonstrated on the farm of Willard Challender. One 7-acre field near his barn has provided abundant and almost continuous pasture for his hogs for 3 or 4 years. Last season more than 1,800 pounds of brome grass seed was harvested from this field.

W. F. Kasitz, near Walton, plants brome grass with sweet clover at the rate of 15 pounds of brome to 4 pounds of sweet clover, for each acre. He has found this combination provides excellent pasture for his sheep and dairy cattle.

Moving farther south and then went across the Arkansas river, farmers in other counties have welcomed brome grass to their farms.

From there on west, brome grass appears only in relatively small areas, but it may be found all the way to extreme Western Kansas. In Finney county, Herbert Meyer has 28 acres of brome grass on his farm west of Garden City. The crop, now 4 years old, is raised under irrigation, and Mr.

Meyer considers it one of the most valuable pasture grasses that can be grown there.

"For many years this country has needed a good perennial grass that will respond to irrigation, and now we have found that grass in brome," Mr. Meyer declares. He says it will not yield so well as Sudan, but it offers a longer grazing season and it is more practical in present times of labor shortage because it does not have to be planted every season.

Under irrigation, brome does not require any large amount of water, but it may need water rather frequently, Mr. Meyer has discovered. During dry seasons he sometimes irrigates the brome grass as often as every 10 days. A little sweet clover is mixed with his brome grass, which is grown primarily for pasture purposes.

New Way with Oats

Condensed from Capper's Farmer

FARMERS in Rock county, Wisconsin, have a new way with oats. It is used to thicken legume crops and give higher yields of high quality hay. Mrs. F. J. Beilharz seeds them in second year sweet clover and finds the combination, cut from the time the oats start to head until they are in early milk stage, makes a high yield of hay that produces as good results at the milk pail as alfalfa. The field was mown when clover and oats were 40 inches high. She says the combination cures better than either crop alone. The crop was cut before any clover blossoms opened. Only a few oats heads showed. Oats also go into any thin stand of alfalfa at the Beilharz farm.

Emmett Arnold, a neighbor, uses oats to thicken sweet clover for pasture. An ice storm left him only a 10 per cent stand of sweet clover, but oats seeded into it gave a pasture that carried more than a cow to the acre to August 1.

When grain lodged and thinned a new seeding of alfalfa, Art Howarth in the same community made a seeding of 5 pecks of oats an acre on all damaged spots. They were cut for hay just as the first heads began to emerge from the boot. That is the right time to cut oats hay, Howarth says. The feeding value then is just as great as when the crop is more mature, and the feed is more palatable. Howarth seeds sweet clover or alsike for a crop the next year on such spots.

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Electro-Agriculture Emerges — and Awaits More Equipment

Harry Slattery

Administrator, Rural Electrification Administration

FARM products may be divided in two principal categories—the basic field crops and the secondary finished, or semi-finished food products of the dairy barn, the feed lot, the poultry yard and the vegetable garden.

Production of field crops such as wheat, corn, and cotton has long since passed from the era of the wooden plow, the hand seeder and the cradle. These relics of primitive agriculture have properly been relegated to museums and galleries of the ancient arts. The tractor, the gang plow, the power seeder, the combine, the two and four-row cultivators, and the mechanical corn picker have become standard equipment on large American farms. Bulging storehouses of wheat, corn and cotton attest the effectiveness of mechanized mass production methods in the fields.

Meanwhile tens of thousands of farmers are still attempting to apply the manual methods of a pre-Edison agriculture to their secondary production line—the dairy barn and feed lot, the poultry yard and the vegetable garden.

The nearly two and a half million farms in the United States that are now receiving central station electric service have the prime requisite for producing more and better food with less labor by applying electrical production aids to their year-round job. Unfortunately, however, an extension from the power distribution line to the farm house or outbuildings does not automatically make an electrified farm. In fact, relatively few of the farms wired for electricity are "electro-agriculture" units in the sense that production is geared to electric-powered equipment.

Too many farmers, when they first obtained electricity, were unable or hesitated to make the necessary investment in new appliances. Now war has greatly curtailed the amount of equipment available and many farmers who would like to install labor-saving devices, both to increase production and to replace men who have entered war service,

are unable to do so because the needed manufactured articles are no longer on the market, or the supply is limited by priority regulations.

On the other hand, on numerous fairly well-equipped farms, full use is made of the tools on hand. Despite the fact that the use of labor-saving equipment has not fully kept pace with the rapid expansion of rural electrification during the past seven years since the establishment of the Rural Electricfication Administration, much real progress has been made.

Electric-powered feed grinders and mixers, milking machines, water under pressure for stock, and milk cooling apparatus, have greatly increased efficiency, and thus helped to maintain production on electrified dairy farms.

Electric chick brooders have implemented a vast expansion in poultry raising, in many cases on a year-round schedule, where once only late winter and early spring brooded poultry was considered profitable. Lights and automatic water warmers in hen houses on thousands of farms have increased winter egg production. Even ordinary household conveniences have made their contribution toward relieving farm labor shortages; farm women, with their household duties made easier, have found more time to take on new tasks in the fields and at barnyard chores.

Where farmers have been able to obtain equipment, their record is one of constant progress in both production and labor-saving. Our experience on 796 rural systems serving more than a million meters indicates that once farmers realize the advantages of electricity they are quick to make the fullest possible use of their new power and substitute "wired help for hired help." This is particularly true in wartime, when sons and hired men have joined the armed forces or taken employment in war industries, while at the same time increased food production is sorely needed.

An Indiana farmer who operates his own farm without extra help is milking 20 dairy cows. Before he and his neighbors organized the local REA-financed rural electric co-operative, this farmer was milking ten cows by hand. With electric equipment, including a milking machine, he has been able to double his output of milk and still do all the field work and other chores with the same effort he expended before he had electricity.

In one Texas community, war industries and an army camp increased the demand for fluid milk to such an extent that a shortage loomed in the milkshed. Milking machines and electric milk coolers on additional farms along the

REA-financed rural cooperative lines solved the problem and increased the production of grade-A milk to meet the demand.

On one 400-acre Corn Belt farm, two men do the field work, feed 150 head of cattle and produce 4,000 broilers annually. Before this farm obtained electric power from the local REA cooperative, three men were kept busy doing the same job—producing the same amount of food. On this farm electric power has replaced one man of three and production levels have been maintained.

The farmer is indeed fortunate who obtained his equipment before war needs demanded most of the critical materials and factory energy normally going into farm equipment. Factory-made equipment is hard to get and at best will fall short of filling the need. Yet, with the unprecedented needs for food products, the time may soon arrive for a re-appraisal of the importance of modern labor-saving equipment in agriculture's vital war job.

There is no more room for obsolescent agricultural methods in modern America at war than there is for the wooden frigate protecting convoys or for the open biplane of 1918 on the battle fronts. In a total war, when every margin of efficiency in producing armaments is exploited to the utmost, we can ill afford the anachronism of a hand-tooled agriculture. Such an agriculture can no more expect to feed the world's hungry people than a hand-powered industry, equipped with the village blacksmith's forge and bellows, could produce the tanks and ships and planes and guns for today's battle lines.

A recent survey conducted in the State of New York shows 308,000 farm machines are needed to replace old machines beyond repair and to meet expected demands for food production. The "must" list includes 13,000 water systems or pumps, 10,000 brooder heaters, 9,600 milking machines, 8,000 milk coolers and 8,000 electric motors. Present quotas will fall far short of meeting the demand.

In some categories, however, the need can be partially supplied with home-made equipment. REA technicians have designed simple electric chick brooders which can be made in the farm workshop with a minimum of critical material. In some areas high school vocational agriculture and manual training classes have built these brooders according to specifications made available in the community through the local REA system. On farms served by an Oklahoma REA system 600 such brooders were installed last spring and served to increase poultry production beyond all expectations.

A New Hampshire farmer found he was able to produce 12,000 chickens where he had raised only 1,000 before he electrified his farm and obtained electric equipment. A Missouri turkey grower installed 17 electric brooders and an automatic water system when he obtained power and was able to increase production from 1,500 birds to 4,300 with no added labor.

Hog raisers who have used an REA-designed electrically-heated pig brooder declare they are able to save an average of one pig per litter that would be lost if the pigs were left at the mercy of the elements—and the sow. The pig brooder may be built on the farm with materials on hand or easily obtained by any farmer. REA has supplied plans to all its borrowers, and these are made available to farmers.

In addition to poultry and pig brooders, other notable examples of REA-designed home-made equipment are food dehydrators, feed mixers, power adapters, speed reducers, garden watering systems, and various other devices which are limited in wartime trade channels. At the same time, the farmer calls into play his inherent ingenuity; and while he follows his team or rides the tractor, his fertile mind is busy devising original ways and means to work his small motor and harness the new giant at his command. He is learning how to produce more food with less hand labor than ever before.

Originally the REA-sponsored utilization and educational program was designed primarily to increase the use of electricity, and thereby the borrower-system's business volume and revenue, building its financial stability to insure the Government investment. The repayment record of the rural systems attests to the program's soundness; more than 28 million dollars of principal and interest have been repaid while only 21 millions have fallen due, the 33⅓ per cent overpayment representing prepayments made by more than 400 of the operating systems. But such cannot be our purpose in wartime. We could not now justify, to the public or to our own consciences, any action except one directed toward winning the war. REA is following the slogan of Secretary of Agriculture Claude Wickard, "Food will win the war and write the peace."

Aid to farmers in food production is only one of the vital war services REA-financed systems are performing. When the vast industrial and military decentralization program got under way and America went all-out in the war effort, REA systems offered their services for immediate use. Many training camps, airfields, munitions plants and

other installations were able to obtain construction and operating power from the rural lines already serving the area, thus hastening the day when they could be placed in full operation. The farmer-members of the co-operatives took this new war job in their stride. They became partners in equipping our armed services with machines of war. But seeing the armies, navies, and air forces take shape has given farmers a larger view of their own food production job.

Many of them can do that job better because an investment was made in peacetime to equip part of the farm production line with the power and the tools of the new agriculture. Loans of some 360 million dollars, however, had only fairly started to electrify rural America when war interfered, temporarily, with line construction. When rural line construction ceased, money had been allotted for lines to an additional one-third of a million farmers, and applications for loans to extend service to 200,000 more are now on file. Farmers have learned that they can apply their long experience in co-operation to supply another of their needs—that of modernizing their farms with electric power. In doing this, they rely on the Rural Electrification Administration for the credit, technical assistance in building lines, and needed operating advice.

In this connection it is significant that the REA has always offered credit for rural line construction to private utilities as well as to co-operatives and public bodies, the principal requirement being a willingness to serve all possible rural consumers rather than those living in so-called "cream" sections. The fact that more than 95 per cent of the requests for loans have come from co-operatives and essentially similar groups, and about that same percentage of the money thus far advanced has gone to these non-profit service organizations, indicates that farmers fully realize a new day has dawned for their industry.

A Commercial Sheep Feeder Checks on Supplements

Condensed from American Miller

F. H. Doht

THE greatest problem in finishing lambs is the amount of carbohydrates that can be fed to produce fast gains. Great feeding skill is required at a commercial sheep finishing plant, in order to speed up the rate at which the per cent of feeds of carbohydrate character can be increased to produce fastest gains with lowest mortality. And in this connection, mortality begins to become a serious problem; for sheep from the plains just don't seem to be able to take the corn too fast without kicking off.

Thomas G. Marshall, president of the Marshall Bros. Sheep Co., which operates one of the largest, if not the largest, commercial sheep feeding plants in the world located at West Chicago, Ill., has demonstrated his qualifications for such leadership by constant and consistent efforts to improve sheep feeding methods.

Now, if lambs were constantly brought into a commercial feeding station from one district only, perhaps a single system could be devised for feeding them according to needs. But not so at West Chicago. The lambs come in by thousands from Montana, Nevada, other northwestern states, California, Colorado, Wyoming, and even Texas. Their native feeds are of different quality, principally due to the elements in the soil from which grow the grasses which comprise their principal food.

Having had different and sometimes unexplainable results from the varied assortment of sheep of diversified geographical origin, Mr. Marshall decided to do some definite research on his own.

With the sheep background behind him and a keen judgment of feeding results, Marshall decided to experiment with different supplements in an effort to find a supplementary feed that would uniformly help solve the feeding problem; in other words, supply possible deficiencies that had been lacking during the lambs' growing period.

Accordingly, 900 lambs were divided into nine pens at the Belvidere, Illinois, plant. We say lambs, but actually they could

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hardly be so classified. In sheep feeders' terms, they were "bums." They were lambs of Montana origin that had gone off feed, dried up, and become pitiful specimens ready for the scavenger.

Among the nine pens, in addition to the carefully selected basal ration of a mixture of alfalfa—prairie chopped hay, molasses, screenings and corn, was the following differential for each pen in the way of a supplement: Live yeast cells, linseed oil meal, soybean oil meal, tankage, meat and bone scraps, a heavy molasses feed, a proprietary mineral, with two check pens that received only the basal ration.

The results were startling. The pen on live yeast cells came out beautifully to romp into the Chicago Stock Yards and top the market! The vegetable protein pens did well and the animal protein pens did better, only the mortality was higher. However, meat scraps had an edge over tankage.

So Mr. Marshall, being of a practical mind, decided to repeat the experiment. This time he chose a thousand Texas yearlings, which are always a problem as feeders.

But the result was worse than a total flop. Sheep broke through the temporary pen fences set up —they did no good—and results in general completely upset and reversed those of the first test.

But Thomas Marshall is the kind of person who hates to let loose of an undertaking once he has started it. So he transferred all experimental work down to the West Chicago plant, under the capable direction of Thomas Scholes, manager. At this extended and well equipped feeding yard, there were pens which sheep could not break out of, there was feeding equipment, and exact records that were needed in this type of work—and as stated, there was Tommy Scholes — English-raised, hard-headed, died-in-the-wool sheep man.

Under this set-up, the experiments were repeated on Texas yearlings. Again the results were disappointing, except that there was sufficient indication that there was a relation between the type of supplement used and the ability of a sheep to handle a carbohydrate feed. Live yeast seemed to possess a value worth further investigation.

The next experiment was with prefermented feed. Having noted favorable reports on fermenting feeds for poultry, the natural question was, would it do any good for a sheep? So the complete feed was pre-fermented for another group of the Texas animals—not in pounds, but with the required hard work of moistening and handling tons—for at

West Chicago they put more than a few lambs in an experimental pen. Again—no soap!

And so a huddle resulted. Mr. Marshall was unwilling to let loose of his undertaking and the cocky Englishman, Scholes, was equally insistent that they were not getting any place with individual supplements. After studying figures and results, it was agreed that a final experiment be carried on, dumping all of the single ingredients of previous experiments into one pot, mix well, and wait for what happened. After all, when you made vegetable soup, you used more than one vegetable and also added some meat.

Actually, the supplement was not made up in that loose manner. Results of previous experiments were studied by Mr. Scholes. College authorities were consulted, amino acid make-up of proteins considered and probable mineral needs of incoming lambs were in mind. As a result, came an experimental sheep supplement that looked very much like a good hog-feed. But it turned out to be an outstanding sheep supplement that solved the most serious problems of high-pressure sheep feeding.

On the first trial, six pens of Texas has-beens were used. The first five pens weren't so bad, but the sixth was another spectacle, called the "Hospital Pen." In this test, pens 1, 2 and 3 were fed, in addition to the basal ration, the most past-favored supplement, linseed oil meal, with no live yeast, as a check pen, and 1% and 2% of live yeast added, respectively. Pen 4 was fed the Scholes mixture with 1% live yeast, pen 5 the same with ½% live yeast and 6 (the hospital pen) the same as No. 4.

The results were so outstanding for the Scholes mixture as to be almost miraculous. The hospital pen developed into marketable lambs with only a 1½% mortality and a gain cost of 14% less than the check pen. Pen 4, on Scholes' supplement plus 1% live yeast, went to market with absolutely no mortality and a cost of 27% less than the control.

No, this did not conclude experiments. As stated before, Mr. Scholes is hard-headed. He, at times, has some difficulty convincing himself. So, another experiment was started. This time with over 2,000 sheep of western origin divided into four pens—two control, one with Scholes mixture with live yeast and one with Scholes mixture without yeast. The results were all in favor of Scholes with live yeast—and only 5% of the supplement to the total grain and roughage ration was necessary.

New Feeds and Feeding Methods

Condensed from Poultry Tribune

Dr. J. Holmes Martin
Purdue University

THE 1943 model hen, with her big job of filling shells at even a greater rate than her mother, will certainly have to eat differently—but *she can eat well.* No meatless Tuesdays for her!

But she'll be on mighty skimpy meat rations, seven days a week. Not so many fish are being caught nowadays—so not so much fishmeal is available. More beef and pork will be slaughtered, so there should be more meat scrap on the market. But will our hens get it? What about that big pig crop that will be marketed this fall? Hogs need a lot of tankage and meat scrap to balance their rations of corn, alfalfa and minerals. There just won't be enough of any type of animal proteins (milk, fish, and meat) to go around.

With higher priced feedstuffs, new or strange combinations of feedstuffs, less help and more work, and more hens in the same house, the farmer is certainly faced with the same old problems of "waste" in a new light. The three "little devils" of waste that the feeder of poultry, whether he be a commercial poultryman or a farmer with a profitable farm flock, must face in 1943 are:

1. Waste of essential feedstuffs due to poor or improperly balanced rations (you can fill the barrel no higher than the shortest stave).

2. Waste of time with inadequate or insufficient equipment; it even takes more of your time per 100 hens.

3. Waste of money due to overcrowding, lowered production per hen and diseases and higher mortality.

Throughout the Corn Belt, poultrymen have naturally come to look upon corn as the basic grain of the poultry ration. Secretary of Agriculture, Claude Wickard, recently said, "Every bushel of wheat we feed will mean an extra bushel of corn reserve. We can use our reserves of wheat to maintain our margin of safety in livestock feed supplies." Bushel for bushel, wheat and corn are about equal in feeding value for poultry. Wheat is higher in protein, lower in energy value, and has little or no vitamin A. Wheat is economical

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and profitable compared with yellow corn when it can be bought at less per bushel; that is, 60 lbs. of wheat costing less than 56 lbs. of shelled yellow corn. For the laying flock, wheat easily can be used to replace one-half to two-thirds of the corn in the laying ration.

However, with large amounts of wheat in their ration, the hens will need either green succulent pasture or alfalfa leaf meal to furnish the necessary vitamin A. Vitamin A is absolutely necessary in the laying ration. One of the primary reasons why so many dried eggs are now being shipped to our armed forces abroad and to England and Russia, under lend-lease, is that eggs are rich in this essential vitamin as well as many others and certain essential mineral elements.

Another change in poultry rations that will be accentuated by the war effort will be the more widespread use of soybean oil meal in poultry feeding. For many years, there has been some prejudice against using much protein of plant sources for poultry. With the rather alarming decrease in the amounts of animal protein available for poultry feeding from fish, meat and milk, there will be a rapid swing to soybean oil meal and other good vegetable proteins. These substitutions should not be made merely on the basis of protein content. To do so might be a waste of essential feedstuffs. Soybean oil meal is low in minerals which are supplied in meat and fish meal by the inclusion of bones. This mineral deficiency must, therefore, be corrected by using such feeds as bone meal, limestone, salt and manganese sulphate. Recent work at Purdue University has shown that a ration quite high in soybean oil meal is satisfactory for laying hens when yellow corn is fed as the scratch grain at the rate of 10 to 12 lbs. per 100 hens per day, and when the birds have access to ample green pasture.

In order to avoid the waste of essential feedstuffs, poultrymen in 1943 must be particularly careful to avoid promiscuous changing of ingredients or feeds. This is a time to seek the most authoritative advice on feeding problems; don't guess on changes in the ration. Many poultrymen are, no doubt, faced with the problem of using commercial or home-mixed feeds. The major point in consideration should be, "Do I have the time, equipment, ability, and inclination to mix my own feed?" You will find on the market a variety of good commercial feeds. When fed according to instructions they will give good results. If you decide to mix your own feed, by all means get the most recent information on the formulas you plan to use.

Formulas in circulars or leaflets printed several years ago should be carefully re-examined in the light of present prices and availability of feedstuffs. Don't waste needed feedstuffs. Above all, when our country needs the eggs, don't sacrifice on the quality of the ingredients used.

With less help and more work to be done, the poultryman should by all means check his equipment. Each 100 hens should have at least 24 ft. of feeder space (two 6-ft. hoppers, each with two sides available); enough fountains to provide them with six gallons of water per day; grit and shell hoppers sufficient to hold 20 lbs. or a two weeks' supply. Twenty to 25 nests are required to provide adequate nesting room. Adequate equipment is a good investment. It saves labor.

Naturally time is money. One method of saving money that many poultrymen overlook is by producing more eggs. There are three ways by which you can produce more income and avoid the waste of money. Plan your work to secure:

(1) *More eggs per hen* by better breeding, feeding and management.

(2) *More hens per house* by having the house filled to capacity but not overcrowded.

(3) *More days per layer* by reduced laying house mortality which means more eggs per flock.

It is difficult to produce more eggs per hen if a house is overcrowded. This condition of overcrowded poultry houses is one of the most serious mistakes made on the poultry farm. It is a waste of feed, time and money. When is a poultry house over-crowded? Generally speaking, the better the poultryman, the more birds he can carry in a given house. A safe allowance is 4 sq. ft. per hen, while less than 3½ sq. ft. per bird is definitely quite hazardous.

Another problem staring both commercial and farm poultry raisers alike in the face is posed in the question, "With all these changes, should I change my way of feeding chickens?"

There are briefly four methods or systems of feeding the laying flock.

1. Hopper-fed mash with hand-fed grain.

Good poultrymen probably can get the best results following this system. Most mashes are formulated with the idea that the birds will eat about equal parts of mash and grain during the year; more mash than grain in the summer and more grain than mash in the winter. Hand feeding is the best way of gauging the proportion of grain to total feed.

2. Hopper-fed mash with hopper-fed grain.

For the farmer who cannot spend much time with his poultry, this method works satisfac-

torily. In most cases the production may be lowered somewhat, but it does give the birds all they want to eat all the time.

3. All-mash (no grain or scratch).

This system works very satisfactorily and gives good results. The grain is all ground for the birds so they have no choice in the matter. However, there is no need of grinding all the feed for chickens as a hen's gizzard is superior to any mill man has invented.

4. Cafeteria system.

With this system, the protein, vitamin and mineral feeds are hopper-fed as a high protein supplement or concentrate and the grains are all fed in separate hoppers. This allows the birds to choose what they want. Production results are good in numerous cases with this system of feeding. It may prove practical for the average farm flock where grains are available and the birds are allowed to run out of doors. However, if the supplement is fed "straight" the feed manufacturer's suggestions should be sought and followed closely.

When one goes over this whole business of feeding and feeding systems for laying hens there is one thing that stands out paramount. When certain conditions of housing, equipment and nutrition are met, the old hen cares little how the feed is given her. She does demand comfort, protection, and all she wants to eat all of the time.

Milling Wheat at Home

Condensed from Electricity on the Farm

C. V. Phagan

Extension Agricultural Engineer, Clemson Agricultural College, S. C.

ON first thought, milling at home may sound a little bit old-fashioned. If we stop to analyze the problem, however, there are many good reasons why this practice should be encouraged at the present time. Our Government is calling for increased production of various agricultural commodities. Why not go a step further and encourage the processing of more of these products at home or on the farm in order to utilize home labor and equipment to the fullest extent?

One of the big reasons for encouraging home milling at this time would be to cut down on transportation costs. To illustrate: If South Carolina farm families would mill at home only 1/10 of their annual flour consumption, it is estimated that 200,000 freight car miles of transportation could be saved. If the war continues, the transportation problem is bound to become more serious, so home milling may be more important than many of us realize.

Milling at home offers unusual opportunities in obtaining the maximum amount of nutritional values at a minimum expense. Nutrition authorities tell us that the less highly grain is milled or refined the more it contributes in minerals and vitamins, particularly in iron and vitamin B_1. The reason why whole wheat flour is so much more nutritious than white flour is that it contains the husk or outer parts of the wheat kernels where some of the most vital mineral and food elements are stored.

From a strictly monetary standpoint milling at home is a profitable undertaking, provided, of course, that some sort of mill is available or can be secured for grinding. A bushel of wheat worth, say $1.00, can be converted into more than $2.00 worth of wholesome whole wheat flour. This is figuring on the basis of average retail store prices. By home milling, a farm family can thus more than double the value of its wheat for home use. Cash savings can also be made by home milling of cereals, corn

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meal, and grits. Many ordinary breakfast cereals sell from 12c to 15c per pound, but by grinding for home use the average cost will be less than 2c per pound.

Various sizes and types of equipment can be used for milling at home. Both hammer mills and burr mills have been used successfully in preparing flour, meal and other cereal products on the farm. Small hand burr mills, because of their relatively low cost, have been used rather extensively in some sections of the country.

Anyone interested in home milling these days must plan to use equipment that is available because of the increased difficulty in getting new equipment. A regular burr or hammer mill used for feed grinding may be used for grinding whole wheat flour, meal or grits, provided the hammers are in good condition and screens of the proper size are used, or your burr mill has sharp burrs. Some varieties of wheat are much better adapted to hammer-mill grinding than others, so it is not possible to give any hard and fast rules as to what size screens to use, speed of hammers, etc. Even after the product is ground with hammer mills or burr mills, it may be necessary to use hand sifters of varying degrees of fineness to separate the flour from coarser unground products or to separate the meal from grits, etc. Finer grinding may be obtained by putting the grain through the burrs twice.

The use of small mills for home grinding has at least two distinct advantages. In the first place, a minimum investment is required and in the second place, small outfits usually mean grinding of small quantities at one time which results in freshly ground products containing the maximum of nutrients and food elements.

On certain types of hand mills it is possible to construct a home-made wooden pulley by which the mill can be operated with a ¼ horsepower electric motor. A 24-in. wheel on the mill and a 2-in. pulley on the motor gives a very satisfactory operating speed and from tests made there is no serious overloading when the mill is operated for short periods of say, 5 to 10 minutes.

The first requirement for making good quality whole wheat flour or whole wheat cereal is to have a good grade of wheat that is thoroughly clean. The same applies to corn for making corn meal or grits. Ordinary thresher-run or combine wheat usually contains a certain amount of foreign material that should be removed by sifting, fanning, washing, etc.

The first step is to sift the wheat, to remove fine dust, grit or other foreign material. The

next step is to put the wheat in a large tub or pan and wash it thoroughly. Immature grains and other light material will come to the top of the water and are easily removed as the water is poured off. After several washings, the grain can then be spread out on a clean sheet to dry in the sun. Stirring occasionally will hasten the drying process.

The treating of wheat or corn to prevent weevil damage is a point that should not be overlooked in storing grain for home milling when cereal grains are kept over to the following year. Treating should be done before cold weather. Entomologists recommend the use of approximately ½ teacup of carbon-disulphide to an ordinary 50-gallon barrel of wheat which would contain approximately 6 bushels. The carbon-disulphide can be placed in a shallow container and set on top of the wheat and then the barrel covered with a fairly tight cover. Carbon-disulphide, being a gas heavier than the air, settles down through the wheat or corn. Small quantities of grain may be treated for weevil infestation by heating for 30 minutes in the kitchen oven at a low temperature (135° F.)

The flour made of whole wheat by home grinding makes delicious bread, muffins, cookies and some kinds of cakes. With a little experimentation, the family will look forward to baking day.

A Trick on Johnson Grass

Condensed from Missouri Ruralist

MORE and more farm people are learning to face and combat their problems. Typical of this is the program to eradicate Johnson grass from the fertile Mississippi River bottom land of Perry county.

Among our weed pests Johnson grass ranks high, especially in the river counties of Southeast Missouri. It has been allowed to spread, unmolested in the main, until now it has become a problem that may be just a bit large to lick.

This fall the men who operate the good bottom land in Perry county decided that something should be done about Johnson grass. First, they called in Arthur Fairchild, veteran county agent at Perryville, for advice and aid. He in turn called upon J. R. Paulling, to suggest ways and means of eradicating this pest.

Meeting at the little village of McBride, about a hundred farm operators laid plans for action. They heard Mr. Paulling outline the most effective methods of getting rid of the weed.

Two methods are open to the man who has Johnson grass. He can poison it with chemicals, or he can weaken it thru a plan of non-cultivation followed by a shallow plowing which will expose the roots during the winter.

The first method was then demonstrated by Mr. Paulling and Mr. Fairchild on two farms the next day. Sodium chlorate, the chemical found to be the most effective weapon against bindweed, also is the best chemical for killing Johnson grass.

Applied at the rate of 4 pounds to the square rod in the fall, sodium chlorate will effectively kill Johnson grass.

Methods of application vary with means at hand. Best is the regular small hand drill which spreads the chlorate evenly. When no drill is available, a bucket with holes punched in the bottom serves very well. The ground should first be laid off with string into squares, with just a square rod of ground in each square. Then four pounds of chlorate should be weighed out and spread evenly over the measured area. Remember the fire and burning dangers of sodium chlorate, though.

One trouble is that sodium chlorate is now difficult to buy. It is available only in small quantities, so this method of control is limited only to small areas.

One of the advantages of the

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chemical treatment is that the work of eradication is soon done. Other methods take more time and, although they are less expensive, the entire work may be made useless by inability to continue treatment.

Johnson grass cannot be killed by cultivation, as is bindweed. In fact, it thrives on cultivation.

The best system as outlined by Mr. Paulling is to put the infested area in some crop that cannot be cultivated. Alfalfa is one of the best. Permanent pasture or legume pasture of any kind is good.

During several years of non-cultivation the root system of Johnson grass becomes shallower. In cultivated soil Johnson grass puts its roots down several feet, straight down. When not cultivated the roots will extend only a few inches below the soil.

If you don't believe this just go out and try to pull up some Johnson grass in a cornfield. Then step over to an alfalfa field. You'll soon see the difference.

After the root system has come to the surface, so to speak, a shallow plowing in the fall that will expose the roots to the weather will do a lot of good in killing it. The freezing and thawing of winter will work wonders. To make the kill complete, turn some hogs into the plowed field. Hogs consider Johnson grass roots a great delicacy and will root them out and eat them.

Sweet Clover in Texas

Condensed from Coastal Cattleman

E. A. Miller
Extension Agronomist

SWEET CLOVER is destined to play an important part in the agriculture of Texas as soon as farmers realize its value and learn to grow it successfully. It supplies excellent grazing and is unexcelled for improving soil fertility when plowed under. The extensive root system, together with the plants above the surface, adds a great deal of humus, thereby not only adding plant food but also improving the physical condition of the soil and increasing its water-holding capacity.

Results at the Experiment Station at Denton and of demonstrations in various counties have fully proved the real worth of biennial sweet clover as a grazing and soil improving crop in

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north Texas. The annual yellow blooming and annual white blooming (Hubam) are well adapted to South Texas and the Gulf Coastal Prairie as winter and spring legumes. In these sections the seed should be sown in the fall, but further north it is safer to plant in the early spring to prevent danger of being winter killed. Hubam clover is more palatable than the annual yellow blooming sweet clover, and hence is more suitable for grazing. The latter, however, is an excellent winter legume for soil building.

Both the white and the yellow blooming biennial and the white blooming annual (Hubam) sweet clover will grow on practically every type of soil except loose sand, provided the soil contains sufficient lime. The yellow blooming annual will do well even on soil with very little lime. At the Denton Station biennial sweet clover has done well: seeded in close drills or broadcast in February; when drilled in spring oats after the oats have been sown; when planted in three foot rows in fall or spring sown oats; and when alternated with sudan grass in three-foot rows.

If the clover is planted in three-foot rows in fall-sown oats, a small strip of oats should be removed with a sweep before the clover is sown, as otherwise the oats might smother it. It is usually more satisfactory to plant the clover with spring oats in January or February, as then it has an equal chance with the oats. The clover should be cultivated as soon as the oats have been harvested. According to results at the Denton Station, farmers on the black uplands of north Texas who plant oats and need good late summer and fall pasture will find that planting sweet clover in three foot rows in their oats in late February or early March will prove very satisfactory. The growth will be better than where clover is close drilled in the oats.

If planted in alternate three-foot rows with sudan grass, the biennial sweet clover should be sown about the middle of February and the sudan two months later. Grazing should not start until the grass is about 18 inches high. This method will supply good summer and fall grazing. The clover hardly ever gets killed back by cold before December and stools out again in early spring. In west Texas it is easier to get a stand of sweet clover by sowing it in the previous season's corn, cotton, or grain sorghum middles without further preparation of the land than by broadcasting. For this purpose a four-hole kafir or sorghum plate in the planter may be used. The opening sweep or lister point and the covering shovel should be removed. The seed should be cov-

ered lightly by means of a small sack filled with soil or by some other weight dragging behind the seed chute.

They should be planted at the rate of 15 to 20 pounds per acre when planted in three rows. It should always be planted shallow and on a firm seed bed. Most of the failures with sweet clover can be attributed either to planting the seed too deeply or to planting on a loose seed bed. When sown with oats the grain should be drilled in first and then the clover drilled in very shallow or broadcast and harrowed into the soil.

It is important that the oat crop be mowed five or six inches above the ground when harvested for grain or hay, so as not to injure or kill the sweet clover. The biennial clover will then furnish grazing during the summer and fall and also during the following spring and summer at which time it will go to seed. A good crop of hay can usually be harvested in the spring of the second year and the succeeding growth should then be plowed under for soil improvement about the time it goes to seed. Mature clover may also be harvested and threshed for seed. If the seed is allowed to mature the clover will usually reseed itself in the field. For the sake of the land, however, it is better to rotate the crop instead of growing it on the same land year after year.

Since there is no definite way to tell whether the soil is properly inoculated, or whether the bacteria are still active and functioning properly in utilizing the nitrogen of the air, it is a good crop insurance to inoculate the seed before planting.

FOR THE FARMER'S LIBRARY

These books are recommended as outstanding in their field:

Beef Cattle—By Roscoe R. Snapp, Asso. Prof. Animal Husbandry, Univ. of Illinois. John Wiley & Sons, Inc. $4.00.

Beef Cattle Production in the South—By D. W. Williams, Head, Department of Animal Husbandry, A. & M. College of Texas, College Station, Texas. The Interstate Printers & Publishers (1941). $2.00.

Beekeeping—By Everett Franklin Phillips, Professor of Apiculture, Cornell University. The Macmillan Co. $4.00.

Breeding Your Own, or Raising Colts for Pleasure and Profit—By Clarence E. Bosworth. The Derrydale Press ($10.00). A book suitable for the breeders of hunters' and saddle horses.

Dairy Cattle and Milk Production—By Clarence H. Eckles, B.S.A., D.Sc., late Chief, Div. of Dairy Husbandry, Univ. of Minnesota. The Macmillan Co. $3.90.

Dairy Science—By W. E. Petersen, Ph.D., Assoc. Prof. and Assoc. Dairy Husbandryman, Univ. of Minn. Edited by R. W. Gregory. J. B. Lippincott Company (1939). $4.00.

Farm Accounting—By Donald R. Mitchell, Asst. Prof. Agri. Economics, Univ. of Wisc. McGraw-Hill Book Co., Inc. (1941). $2.50.

Farm Shop Practice—By Mack M. Jones, M.S., Prof. Agri. Engineering, Univ. of Mo. McGraw-Hill Book Co., Inc. $2.75.

Feeds and Feeding—By F. B. Morrison, Prof. of Animal Husbandry and Animal Nutrition, Cornell Univ. Morrison Press. $5.00.

Farm Meats—By M. D. Helser, B.S.A., M.S., Prof. Animal Husbandry, Iowa State College. The Macmillan Co. $2.90.

Farm Management—By Robert R. Hudelson. The Macmillan Co. $2.00.

Farm Management and Marketing—By V. B. Hart, Ext. Professor of Farm Management; M. C. Bond, Ext. Professor of Marketing; L. C. Cunningham, Ext. Asso. Professor of Farm Management; all of N. Y. State College of Agriculture, Cornell University. Publishers: John Wiley & Sons, Inc. (1942). $2.75.

Forestry in Farm Management—By R. H. Westveld and Ralph H. Peck. John Wiley & Sons, Inc. (1941). $3.00.

Hunger Signs in Crops—Published by the American Society of Agronomy and The National Fertilizer Association. $2.50.

Home Vegetable Gardening—By Charles S. Nissley, Extension Horticulturist in Vegetable Growing. Rutgers Univ. Press (1942). $1.50.

Judging Dairy Cattle—By Edwin S. Harrison, Professor of Animal Husbandry, Cornell University. John Wiley and Sons, Inc. $2.75.

Livestock Judging Handbook—By Julius E. Nordby, Asst. Prof. Animal Husb., Univ. Idaho, and W. Malcolm Beeson, Ph.D., Asst. Prof. Animal Husb., Univ. Idaho. The Interstate Printers. $2.60.

Livestock Production—By Walter H. Peters, Chief of the Division of Animal and Poultry Husbandry, Univ. of Minn. McGraw-Hill Book Co., Inc. $3.50.

Poultry Husbandry—By Morley A. Jull, Prof. of Poultry Husbandry, Univ. of Maryland. McGraw-Hill Book Co., Inc. $4.00.

Poultry—By A. R. Winter, Asst. Prof. Poultry Husbandry, Ohio State Univ., and E. M. Funk, Asst. Prof. Poultry Husbandry, Mo. State Univ. J. B. Lippincott Co. $5.00.

Pork Production—By William W. Smith, Prof. of Animal Husbandry, Purdue Univ. The Macmillan Co. $3.75.

Practical Poultry Management—By James E. Rice, Emeritus Professor of Poultry Husbandry, and Harold E. Botsford, Extension Professor of Poultry Husbandry, both at New York State College of Agriculture. Fourth Edition (1940), John Wiley & Sons, Inc. $2.75.

Practical Horse Breeding and Training — By Jack Widmer. Charles Scribner's Sons (1942). $3.00.

Sheep Production—By Levi Jackson Horlacher, B.S.A., M.A., Asst. to Dean, Col. Ag. Univ. Ky. McGraw-Hill Book Co., Inc. $4.00.

Soil Conservation—By Hugh Hammond Bennett, Chief, Soil Conservation Service, U. S. Department of Agriculture. McGraw-Hill Book Company, Inc. $6.00.

Some Common Diseases of the Horse—By George R. Conn, B.S.A.H., D.V.M., Orange Judd Publishing Co., Inc. (1942). $1.50.

Some Common Diseases of Cattle—By George R. Conn, B.S.A.H., D.V.M. Orange Judd Publishing Co., Inc. (1942). $1.50.

The Western Horse—Its Training, Type and Marketing. By John A. Gorman, Asso. Prof. Animal Production, Univ. of Wyoming. The Interstate Printers and Publishers. $1.65.

The Farm Primer—By Walter Magnes Teller, formerly with the Farm Security Administration, U. S. D. A. David McKay Co. $2.50.

Vegetable Crops—By Homer C. Thompson, Ph.D., Prof. Veg. Crops, Cornell Univ. McGraw-Hill Book Co., Inc. $5.00.

BOOK NOTES

ANIMAL SANITATION AND DISEASE CONTROL — By Dr. R. R. Dykstra, Dean of the School of Veterinary Medicine, Kansas State College.

For the first time a veterinarian of recognized authority has written an animal disease book for the layman. The most serious menace threatening the interests of the livestock, dairy and poultry producer is animal ill-health. The purpose of Dr. Dykstra's new book is to lay a genuine foundation for the prevention of animal ailments, many of which are controllable if care, based on established principles, is taken. The book is for the teacher, the student, the sanitarian, the producer, and for all those interested in conserving livestock health.

Publishers: The Interstate Printers and Publishers (1942). $2.85.

For the convenience of our readers, books listed may be purchased through this Department. Address Farmers Digest, Ambler, Pa.

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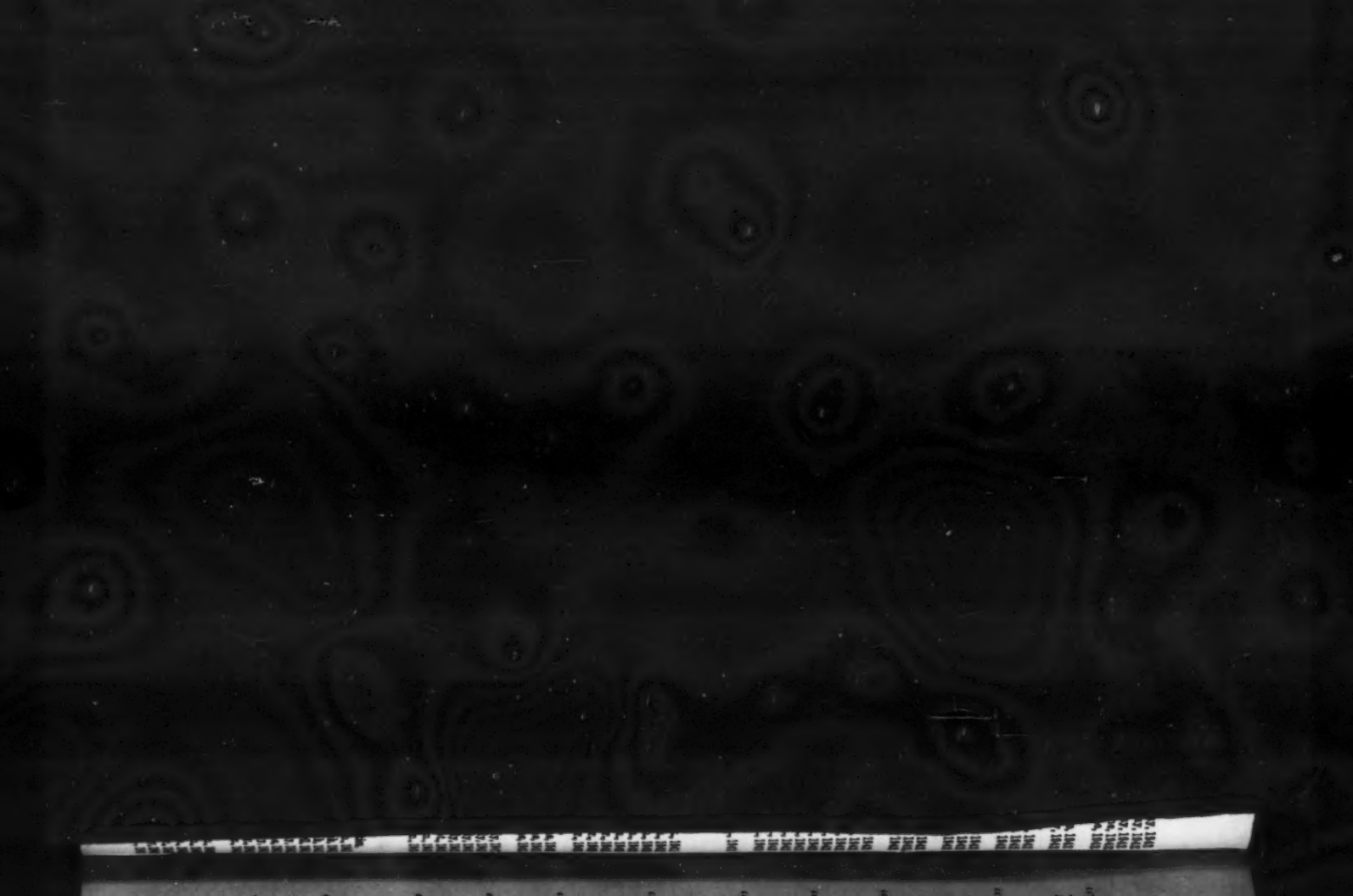

COMMENTS

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"I want you to know that I am receiving a liberal agricultural education from your Farmers Digest."—*Pennsylvania*

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—*New Zealand*

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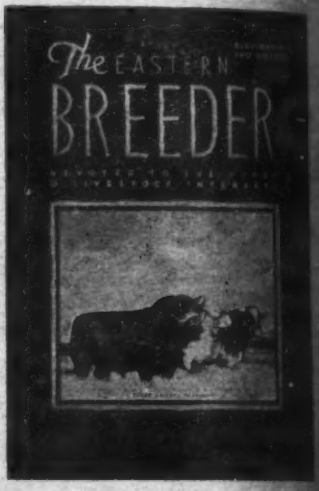
THE EASTERN BREEDER



The Eastern Breeder began serving farmers in 1939. First it went to Virginia stockmen and horsemen. Soon subscribers came to it from Texas, California, Washington, and other states west of the Mississippi—they wanted news of Eastern activity. So now this magazine comes to farmers all over the Nation.

It talks about breeding, buying and selling the way we farmers — breeders, stockmen, horsemen, talk to each other. It contains the useful Eastern Breeders' Calendar of sales, races, meets; brings preview descriptions and results of important sales with names of sellers and buyers of livestock and horses; it supplies information to help farmers buy for improvement, breed, feed, prepare for market, and sell at good prices. All this is spiced with the gossip that horsemen and stockmen like to exchange.

The subscription price is $1 for an eight month trial; $2 for one year; $3 for two years.

The Eastern Breeder is edited and published monthly by Hubert B. Phipps, owner of Rockburn Farm. He will be glad to send you a sample copy, free, if you write to him at Warrenton, Virginia.

The above is printed for the information of our readers, and as a courtesy to the sources of our information.

The Johnson Press, Ambler, Pa.